

Improving Children's Recall of a Personal Event

**Submitted as partial fulfilment towards the Masters Degree of
Clinical Psychology**

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I certify that the substance of this thesis is my own work and has not already been submitted for any degree, and is not currently being submitted for any other degree.

I certify that any help received in preparing this thesis, and all sources have been acknowledged in this thesis.



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Abstract

Cuing techniques which rely on the experimenter to select appropriate cues have been shown to increase recall but also increase errors in children's recall. To investigate the use of emotion as a cue to enhance young children's recall of a happy event, 56 5 and 6 year old children were read a story in their kindergarten classroom by a clown. It was predicted that emotion cues, which can be produced by the child and therefore reduce possible experimenter interaction, would not inflate errors, and would increase recall. Children were randomly assigned to one of three recall conditions: (a) free recall, (b) constructing a facial expression consistent with the original emotional state prior to recall, and (c) engaging in emotional re-enactment of the original emotional state prior to recall. Compared to the free recall condition, emotional re-enactment was found to significantly increase the amount of accurate information recalled by children while facial expression had no effect on recall. Children made very few errors in all of the conditions. Emotional re-enactment was a useful strategy for cuing children's happy memories without inflating the number of errors in recall. The usefulness of this technique is discussed in terms of its application to clinical and investigative interviews with children.

Introduction

Clinical interviews with young children rely on children's abilities to respond openly and accurately to adult questions. Under conditions of free recall young children typically recall limited information. When the interviewer introduces verbal cues and physical props to enhance memories, the amount of information recalled by children may increase but often becomes biased and inaccurate (Pipe, Gee & Wilson, 1993). Therefore it is necessary to find a method of prompting young children's memories which improves recall without introducing bias or inaccuracies.

Network theory (Bower, 1981) maintains that emotional states can be used as cues to enhance accurate recall. An emotion generated by the child themselves, may be less prone to experimenter bias than experimenter-introduced props and cues because the child does not rely on the experimenter's interaction for cues. The aim of the current study was to investigate the efficacy of two methods of mood induction to cue children's recall.

Use of Probes and Props to Enhance Children's Recall

When young children are interviewed within a clinical setting their cognitive capacities should allow them to accurately recall a narrative about their past experience. Between the ages of two and three, children's language skills develop quite rapidly, allowing them to become much more effective in communicating their ideas. By preschool age, most children can recall a personal event with a basic narrative structure (Hudson & Haggren, 1987). Also by the age of three children talk about future and past events rather than express themselves about current

events only (Hudson, 1990). Although children's narratives become more elaborate and complex with age so that 5 year olds have the capacity to easily relate a narrative about a past personal event, young children typically fail to provide lengthy narratives. For example Pipe, Gee and Wilson (1993, p.25) questioned 5 and 6 year old children about a complex event that was staged in the classroom ten days before. When children were asked what had happened their responses were brief for example, "We did a magic show." While the response in this example was accurate it did not provide any elaboration about the central event.

The interactive learning model (Hudson, 1990) maintains that younger children actually rely on adults to prompt and guide their memories which explains why their free recall is limited. This model is based on Vygotsky's (1978) theory that all higher mental functions develop in the context of social interactions. The model posits that remembering is a joint interaction carried out between a parent and a child. The parent helps the child elicit information by asking direct questions such as, "Who was there?" or "Where did we go?" Gradually the child learns to prompt his/her own memory, internalise these cues, and form a self-regulated memory (Eisenberg, 1985; Lucariello & Nelson, 1987). It is only when a child recognises that remembering is important to others that he/she actively practices remembering without the use of external prompts. Until then, prompting the child may reduce the demands on the child by providing memory cues which enhance and guide their recall.

Following from this model, verbal cues and questions have traditionally been used to enhance children's recall. To investigate the effects of free recall versus specific questioning on older children's ability to produce a detailed narrative, Dent and Stephenson (1979) undertook a study to obtain evidence from 10 and 11 year old

children. Children watched a brief colour film of a man stealing a parcel from a car. They were then asked to remember the film using one of the following forms of recall: free recall, general recall (for example "what happened to the man in the *truck*?"), and specific recall (for example "what colour hair did the man in the white *truck* have?"). Dent and Stephenson found that the children in the free recall condition produced highly accurate but incomplete reports. Children in the specific recall condition recalled more than twice as much information than children in either the free recall or general recall conditions, but specific questions resulted in significantly more inaccuracies. Thus even for older children free recall restricted the quantity of memories they could provide although these memories were very accurate. In contrast using specific questions enhanced recall but increased errors.

Dale, Loftus & Rathburn (1978) showed that younger children's recall of an event could also be influenced by specific verbal questions. Four and five year old children watched four one-minute films and were asked a series of questions about them ten minutes following the last film. The questions were generated by a combination of positive and negative phrases ("Did you see...?" vs. "Didn't you see...?"), an article (*the, a, any, or, some*), and an item that was either present or absent in the film (eg. "Did you see any elephants?", "Didn't you see the elephants?"). If children were asked about an item that did exist the wording of the question did not matter and most children responded correctly that they had observed the item. However when children were asked about an entity that was not present in the film, then the form of the question significantly affected the probability that they would report having seen the item. Dale et al (1978) found that the questions framed as "Did you see the ?", "Did you see any ?", and "Didn't you see some?" were more likely to be answered "yes" than other types of questions. Such responses indicated that children had incorporated the interviewer's

suggestions into their memory of the event. This study showed that young children were aware of the expectations conveyed by certain linguistic forms, even subtle forms such as "the" suggested to the children that the interviewer was seeking a particular response. These mild verbal cues reduced the accuracy of the preschooler's responses indicating that interviewers must be very cautious when using verbal cues with young children.

Despite this caution, there is some debate as to the magnitude of the effect verbal cues have on young children's recall. While some studies show that younger children are more susceptible to suggestive questions than older children (Ornstein, Gordon & Larus, 1992; Oates & Shrimpton, 1991) and that children in general are more susceptible to suggestion than adults (Cohen & Harnick, 1980; King & Yuille, 1987); there are also studies which have found younger children actually resist suggestion better than either older children or adults (Duncan, Whitney, & Kunen, 1982; Marin, Holmes, Guth & Kovac, 1979). Proponents of this view argue that younger children may resist leading questions because their memories of events remain unaltered. Younger children do not reflect on their memories, instead they are passive stores of information. At the age of six years, children begin to enter Piaget's concrete operations stage. At that point they can use specific mental operations to organise previously stored material. As comprehension develops, children modify their mental representations to conform to their new understanding (Penny & Wrightman, 1991) so that from six years of age, children are more likely than their younger counterparts to distort the original memory. Ceci and Bruck (1993) reviewed ten studies carried out over the past twenty years and concluded that the debate about younger children's degree of suggestibility could not be settled without further research. They noted that although each study provided evidence either for or against age differences in children's suggestibility, within each study

there were also conflicting results. So although it appears that all children are influenced to some extent by verbal cues and questions which may reduce the accuracy of their recall, it is still unclear as to whether younger children are more suggestible.

There are also other problems associated with using verbal cues and specific questions to conduct interviews with young children. Children of all ages will respond to meaningless or bizarre questions such as "Is red heavier than yellow?" if they are asked to do so by an authoritative experimenter (Pratt, 1990). Further exacerbating this problem is that children, and younger children in particular, rarely ask for clarification when they do not understand a question (Warren & McCloskey, 1993). When an authoritative adult asks a series of direct questions a young child is likely to provide a series of responses but the validity of these responses is sometimes questionable. Together with the findings from the suggestive questions studies, these results suggest that while the amount of information provided by young children will increase when they are questioned with verbal probes, the accuracy of this information will decrease.

To avoid the problems associated with verbal cues, non-verbal cues such as props or situational re-enactment have been used in interviews with young children. By using visual cues to prompt children's memories, specific verbal questions can be minimised or avoided. Props may enable young children to demonstrate their knowledge of routine events such as going to bed or bathing, which they might otherwise find difficult because of their limited language (Pipe, Gee & Wilson, 1993). In contrast situational re-enactment involves taking a child back to the original environment where an event occurred and this provides the child with accurate visual cues for the event and physical props which also assist the child to

explain the event. Thus non-verbal cues may provide children with opportunities to extend their recall of events.

Studies on the use of physical props have generally found that props, like verbal cues, can result in much more information being generated by the child, but that again the information often contains many more errors. Saywitz, Goodman, Nicholas and Moan (1991) found that when they asked 5 and 7 year old children to recall undergoing a medical exam by either (a) free recall, (b) by the use of anatomically correct dolls and model doctor instruments, or (c) by direct questioning, re-enactment using the props resulted in twice as much recall. Yet the use of these props significantly increased children's error rates. The majority of these errors related to the props, for instance choosing incorrect medical instruments or the wrong number of dolls to re-enact the event. Roughly half the children included a tongue depressor in the re-enactment, which is common to many doctor's visits, but was not used in the experiment by Saywitz et al.

Saywitz et al (1991) highlighted a particular problem associated with props, those which are introduced by the experimenter may be seen by the child to have marginal relevance to the event. Irrelevant props, such as the tongue depressor, could have a suggestive function which misleads children into making errors in their reports as they attempt to incorporate the prop into their memory of the event (King & Yuille, 1987). However even relevant cues and props could mislead children, and prompt them to describe activities that are associated with the prop item but irrelevant to the topic of interest (Piaget & Inhelder, 1973).

Because of these problems props are rarely useful in interviewing young children. Situational re-enactment may avoid some of these problems. Smith, Ratner and

Hobart (1987) showed that re-enactment significantly enhanced children's recall without increasing error rates in their reports. Kindergarten children were shown how to make clay and then asked to describe what they had done, first in free recall, and then in one of three retrieval conditions. In the control condition children simply described again what had happened. In the second condition the original utensils and ingredients for clay-making were visually displayed but not physically accessible and the children were asked to recall how they made the clay. In the third condition the children were asked to re-make the clay and describe the procedure as they did so. When the visual objects were present, children recalled about 20% of the actions they had produced, the same as children in the free recall condition. However children in the re-enactment condition recalled over 80% of their actions which was significantly more than the number recalled by children in either of the other two conditions. Furthermore error rates were low across the three conditions (<1% of total recall) and were not significantly affected by the experimental conditions.

Smith et al maintained that children did not fully encode events in a verbal form and that reconstructing the action was necessary for children to demonstrate their full knowledge of the event. Viewing the ingredients and utensils selected by the experimenter may have provided cues about *what* they used to make the clay but did not provide sufficient cues about *how* they made the clay. By re-enacting the event, children were also able to prompt the memories of their actions. All three conditions allowed the children to select their own cues from the original set of cues, avoiding the problem of bias or distortion from experimenter introduced cues. Had an experimenter selected a set of cues approximating the original event, the relevance of the cue would have been uncertain and the child's ability to select amongst cues restricted, making errors likely. This study showed firstly that re-

enactment of an event improved recall over free recall or visual cues. Secondly this study showed that self-generated cues did not increase error rates. One problem with situational re-enactment is that it is not always possible to re-visit the exact location or environment where events have occurred. Consequently this technique would be difficult to apply to clinical interviews with children.

In summary the results of the free recall studies show young children are restricted in their ability to generate information from their memories. They rely on adult interaction for memory prompts and may not use self-produced strategies or cues to assist their memories. Unfortunately when verbal prompts or visual props are offered by the experimenter, children's recall of details increases, but the recall also become less accurate. In contrast, self-generated cuing techniques, such as situational re-enactment, allow the child to generate his/her own cues which improved accurate recall without the associated increase in errors. Situational re-enactment however, is not practically applicable to most clinical interviews with children. Alternative methods of cuing which allow the child to cue their own memories rather than rely on experimenter cues need to be explored. Network theory (Bower, 1981) suggests that emotional material is encoded with memories and that emotional re-enactment could prompt memories without effecting error rates.

Network Theory

The Network theory of memory was developed by Bower (1981) and his colleagues (Bower, 1987; Gilligan & Bower, 1984; Bower & Mayer, 1989). The theory maintains that thoughts and memories operate within a semantic network of inter-related units of propositions and concepts. A memory for a single event is a

discrete cluster of units or nodes linked to represent a verbal narrative of the event. This semantic narrative is overlaid with nodes of sensory information from the sensory organs as well as emotions and other internal physical sensations such as movements and balance.

Associative connections between these nodes are established which vary in strength, depending on how closely the descriptors relate to one another. These connections not only exist between the nodes of a particular event in memory, but also between related nodes from other events in the memory network. For example consider the event where Sam lost his toy aeroplane and this made him feel sad. An event could be created in Sam's memory with the concepts of loss, toy, aeroplane and sadness linked by associative connections. There may also be weaker connections between that event and other related events in Sam's memory about toys, aeroplanes or feeling sad.

Thoughts occur via the activation of nodes and their associated connections within the semantic network. This activation can be triggered by either external cues from the environment or internal cues such as ideas. Once activated, a node further transmits activation to related nodes depending on the strength of existing connections so that one idea can activate a number of related concepts in the network.

Retrieval from the memory network also occurs by following associations from some stimulus cue. Activation stems from the stimulus cue but dissipates as it spreads over many pathways so that closely connected nodes may be strongly activated, while nodes with weaker connections may receive less or no activation. Each node must reach some threshold of excitation for it to reach conscious

awareness. Some nodes will be activated by way of the spreading activation but may not be sufficiently activated to break the threshold for consciousness. Bower (1987) suggested that the spreading activation is like the flow of electrical current in a circuit network, and ideas are like light-bulb terminals that "light-up" and become conscious when they accumulate enough activation. This explains why most memories are only partly retrieved since not all parts of the memory will be sufficiently activated in either children or adults.

The Network theory explains how cues function to prompt and enhance the recall of children's memories. Bower suggested that in general retrieval from the network involved searches emanating from at least two nodes in a cluster. If retrieval could occur through activation of a single node then one's consciousness would be constantly flooded with ideas from even simple thoughts or emotional states. The activation from two or more nodes, though, could summate to sufficiently arouse connected nodes and bring ideas into consciousness. In a free recall paradigm young children's recall may be limited because they lack strategies to cue a sufficient number of nodes and cannot bring memories into conscious awareness. However cues would assist children by adding activation to the network and increasing to the arousal of the event which is to be remembered.

Consider a cued recall paradigm where a relevant prop is used to enhance a child's memory. The child's attempt to cue the memory alone might be limited by a lack of available strategies. However the combined activation from the child's attempt at remembering plus the activation caused by the prop, would cause some nodes to reach the threshold of consciousness and be remembered. Without the added activation from the cue these nodes of information would remain otherwise unremembered and this is how cues can facilitate recall. However if a prop chosen

by the experimenter was not relevant to the child, it might introduce errors in the child's recall as he/she attempted to incorporate the cue into their memories thereby changing their memory to accommodate the cue (Dale et al., 1979). Cues deemed irrelevant to the to-be-remembered event might also increase errors by stimulating the child's memory of the wrong events. Such a cue might activate nodes in the network about events which were related to the cue but not to the event in question.

While the research on Network Theory has largely focused on adult subjects, a study by Rovee-Collier and Hayne (1987) showed that visual cues can activate even infant's memories. Three-month old infants were taught to move a mobile by kicking a string tied to their leg. When they saw the mobile again they "remembered" how to move the mobile for up to 8 days on average, but by two weeks they appeared to have "forgotten" and looked at the stationary mobile, but did not kick. However if after a two week interval the infant was shown the mobile when it was moving, rather than stationary, they then "remembered" how to move it and re-instigated the kicking action. Rovee-Collier and Hayne concluded that the memory was not lost, however it needed a stronger cue than the stationary mobile to activate it. An associated visual cue, the moving mobile, re-activated the physical memory of kicking demonstrating that visual and motor perceptions are linked together in the memories of infant.

Another study using older children also provided support for Network theory (Parker, 1995). Six and ten year old children were read action vignettes which either involved interaction with a confederate or passive listening of the vignette. After two weeks children of both ages better remembered the vignettes in which they had performed actions rather than just listened to the vignette and imagined the actions. Parker suggested that the event involving real physical action had caused

more sensory activation (and therefore greater network arousal) than passive listening. More network pathways were then activated at encoding with strong connections established between these pathways. At recall overlays of sensory experiences were activated causing greater arousal of the cluster and better recall of the event. Overall there is evidence to support Network theory in infants and six and ten year olds suggesting Network theory can be applied across developmental levels of childhood.

The Role of Emotion in the Memory Network

Since Network theory maintains that the nodes from a memory of an event are overlaid with nodes of sensory information, emotions and physical movements, any of these nodes could act to cue the verbal. Network theory maintains that emotion may be a particularly useful cue for enhancing the recall of past because of the way it functions at recall compared to other nodes.

Gilligan and Bower (1984) maintained that emotion nodes function like other nodes in the network with a few exceptions. First, emotions are more prone to internal activation than semantic nodes in particular. All nodes in the network, including emotion nodes can be activated by internal thoughts. Emotion nodes are also directly connected to other emotion nodes, facial muscles and levels of autonomic arousal. Thus emotions may be more easily aroused through internal processes, such as the imagining or acting of emotions, than other nodes. Second, once activated, emotion nodes stay aroused for some time until a natural dampening process occurs. The persistent arousal results in ongoing activation of the network and increases the chance that related concepts will also be aroused. Such persistence does not usually occur through activation of a simple thought or idea

which generally disappears from working memory once the idea is replaced by a new one. Third, once past a threshold and "turned on", emotion nodes can send more "voltage" to surrounding nodes than simple concept nodes. This would cause an emotion to gain greater control than a thought over the direction and content of subsequent thoughts or memories. Therefore emotions may be more easily activated by a subject and thereby reduce the reliance on external cues. Furthermore, once activated, emotion nodes play a stronger cuing role than other semantic nodes.

Emotion can also play a useful role in cuing recall because researchers maintain that there are a discrete number of basic emotions which occur across cultures and combine to form complex emotional states (Plutchik, 1980a; 1980b). For example Plutchik (1980a) proposed the following eight primary categories of emotion which could be represented in a circle with related emotions adjacent to one another and contrasting emotions opposite one another: joy, acceptance, fear, surprise, sadness, disgust, anger and anticipation. For visual stimuli there may be infinite instances in one's memory and an interviewer would need a huge set of visual props to match these stimuli. For emotional stimuli there exists a finite set of basic emotions which are associated in various combinations with each event in our memory. Thus there is also a set of basic emotional cues available to activate, isolate and recall information from our memory network.

Gilligan and Bower (1984) offered four hypotheses to explain how emotion affected memory and other cognitive processes. First, they hypothesised that an individual's memory for an event would be enhanced if their mood during recall matched their original mood at the time of learning (*mood-state-dependent recall*). Thus if an individual were happy when he/she first experienced an event their recall

of that event would be best when they were in a happy mood. Second, they hypothesised that cognitive processes were likely to be congruent to mood (*thought congruency*). That is an individual's free associations, interpretations, thoughts, and snap-judgements would rely on the existing mood state with happy people more likely to make positive interpretations and judgements of events. Third, they hypothesised that emotionally toned information would be learned best when there was correspondence between its affective value and the learner's current mood state (*mood-congruent learning*). Thus an individual in a happy mood would be more likely to encode and learn positively valenced items while sad individuals would be more attuned to negative items. Fourth, was the hypothesis of *mood intensity* which stated that an increase in intensity of mood would cause an increase in the activation of the associated nodes in the network. Thus an intense mood would result in greater activation of the network than a subdued mood.

Gilligan and Bower (1984) found evidence to support the four hypotheses with adults (see also Bower, 1987; Bower, 1981). The support for the hypotheses of thought congruency and mood-congruent learning highlight the importance of emotion in the network and highlight that reciprocal pathways exist between emotion and cognition. Emotion is not only a product of thoughts, in turn it can also influence thought processes such as perception, attention, and learning. The hypotheses of mood-state dependent learning and mood intensity are of particular importance to enhancing recall and will be discussed in some detail.

The first hypothesis (mood-state-dependent learning), that a matching mood state at learning and recall can enhance the retrieval process, is a well established finding (Bower, 1981). Bower proposed that emotional states at retrieval function as memory cues by spreading activation to related emotion nodes as well as to the

associated concept nodes. These nodes therefore become partially aroused prior to recall. When an individual attempts to retrieve these memories they are more easily aroused into consciousness because of the added activation brought about by the emotion. In this way emotional states can enhance the recall of past emotional events. However Bower also hypothesised that a competing emotional state would inhibit retrieval. First, because the competing mood would fail to activate concepts related to the to-be-remembered event and second, because the mood would activate other memories associated with the competing mood which would interfere with the retrieval of the event.

For example, Bower, Monteiro and Gilligan (1978) undertook a study employing a hypnotic design to show the mood-state-dependent learning effect. Six groups of hypnotised adult subjects learned List A (16 words long) while either happy or sad. They then learned List B (16 words long) again while happy or sad, and finally were asked to recall List A in either a happy or sad emotion condition.

Figure 1 shows a diagram of what has come to be a traditional design, where control subjects learned and recalled both lists in a single mood. In the facilitation condition, marked by plus signs, the subjects learned List A in one mood, learned List B in a different mood, and were asked to recall List A in their original mood. In the inhibition condition, marked by minus signs, the subjects learned list A and B in different moods, and were then asked to recall List A in the mood opposite to their original mood. Bower predicted that learning the lists in different moods isolated them in the memory network. Subjects in the facilitation condition would have enhanced recall of List A because of the match in mood at encoding and retrieval and reduced interference from List B which was learned in a competing mood state. The inhibition condition would subsequently restrict the quantity of

recall because a competing emotional state had been employed at recall, triggering competing memory descriptors.

Mood-State-Dependent Recall

Learn A	Learn B	Test A
HAPPY	Sad ----->	Happy (+)
	Happy ----->	Happy (0)
	Sad ----->	Sad (-)
SAD	Happy ----->	Sad (+)
	Sad ----->	Sad (0)
	Happy ----->	Happy (-)

Figure 1. Diagram of design employed by Bower (1981). Plus signs designate the facilitation condition, minus signs designate the inhibition condition, and zeroes the control condition.

As predicted mood-state-dependent recall was obtained since recall of information was substantially improved in the facilitation condition. There was a 75-80% retention rate when information was learned and recalled in the same mood state for the happy and sad conditions respectively. Only 45% of the list was remembered when the inhibition condition was employed regardless of the emotion. Controls remembered approximately 55%. The results showed that information learned in one emotional state was better retrieved when the state was re-experienced under hypnosis while recall was reduced when the opposite mood was re-experienced.

The study by Bower et al (1978) showed that both a happy and sad mood state affected retrieval. Thompson (cited in Bower, 1981) demonstrated that the mood-state-dependent learning effect also existed for fear and anger. Subjects were hypnotised and taught four different word lists, each under one of four emotional states, happiness, sadness, anger or fear. After induction of a specific mood subjects learned one list, then their mood was switched and they were given a new word list to learn. After studying the four lists, the subjects' recall was tested for each list while the subjects were in one of four moods: the same mood that they had learned the list in, the opposite mood or one of two adjacent moods (according to Plutchik's categories of emotion).

When subjects were induced into a mood that was the same as that at learning, retention of the list was very high (85%). When subjects recall was tested in a mood state adjacent to the original mood (for existence learnt in a happy mood and recalled in an angry mood), recall was somewhat reduced (70%) and when subjects were tested in the mood opposite to their original mood state, recall was lowest (54%). Thompson concluded that specific emotional states had affected retrieval since recall was best when the mood at recall and encoding matched identically, and that different emotional states functioned as discrete nodes in the memory network. Bower (1981) acknowledged that these results supported Plutchik's proposition of primary emotional states and showed that the semantic network may also be ordered according to these categories of emotion.

While the category of emotional experience must be matched at retrieval to optimise subjects' recall the intensity of the emotional state may also need to be matched for optimal recall (Gilligan and Bower, 1984). Gilligan and Bower (1984)

supplied experimental evidence to show that mood intensity resulted in quantitative changes to the network, with intense moods yielding greater activation overall than mild moods. They also proposed but did not test, that the intensity of an emotion also involved qualitative changes to the encoding of the emotional experience. For each emotion there are nodes of varying levels of intensity. For example an emotion such as anger could be experienced in levels of varying intensity, progressing from annoyance to anger to rage and an individual would associate different events and behaviours with each level of the emotion (Gilligan & Bower, 1984, p. 577). They proposed three types of emotion nodes defined by their level of intensity: low, moderate or high.

Moderate nodes operate as the primary emotion nodes. They become activated when a moderate level of mood is experienced. They are connected to low and high intensity nodes and activate these when either low or high levels of excitation are received. High and low intensity nodes are also linked, but with inhibitory connections, so that when intense arousal such as rage occurs the annoyance or low intensity emotion nodes are switched off.

The intensity of emotion experienced during the encoding of an emotional event defines what type of emotion node will be encoded with the event and determines what threshold of arousal will be required at recall to achieve activation of that node. Thus rage and annoyance are discrete nodes in the memory network and memories related to each emotion would only be aroused by re-experiencing an emotion approximating rage or annoyance respectively. This hypothesis also maintains that a mood state which matches in type but not in approximate intensity would not enhance recall of an emotional experience. A mild mood state would not

enhance the recall of a moderate or intense emotional experience nor would an intense mood state enhance the recall of a mild emotional experience.

No experimental studies have yet been done to investigate the refined mood intensity hypothesis of Gilligan and Bower however the hypothesis poses difficulty for experimenters and interviewers alike who may want to improve a child's recall of a past event without knowing the exact nature of the original emotional experience. Inducing the wrong type or intensity of mood may have two effects according to Network theory. First the retrieval of the event in question would not be enhanced and may even be inhibited if an opposite mood type or mood intensity were induced. Second the child's retrieval of other events may be enhanced so that he/she recalls the wrong event. The challenge is to find a method of mood induction which removes the interviewer's responsibility to induce the mood and instead allows the child to induce his/her own mood state and to identify the category and intensity of the mood state themselves.

Overall Network theory proposes that emotions should significantly enhance recall of past events. Emotional states are likely to exist in finite categories within the network, so that a discrete number of states can be used as cues. Emotional states can be easily activated by individuals and once activated have a stronger effect on the network than other types of nodes so that emotion may operate as a stronger cue than verbal or visual prompts. There are two considerations with the use of emotional states in mood-state-dependent paradigms. First emotion has been effectively shown to enhance adult's recall of past events provided the emotion was perceived to have caused the event (Bower, 1987). Second, recall might be optimised if the intensity of the mood at recall closely approximates the intensity of the mood at encoding.

Methods of Mood Induction used with Children

A range of techniques for mood induction has been used with adult subjects and shown to successfully achieve a mood state and subsequently enhance recall of emotional memories. The methods of mood induction used with adults apart from hypnosis have included reading a list of emotional statements (Velten, 1968), situational mood induction (Isen, Shaker, Clark & Karp, 1978), and imagery (Qualls, 1982). There are also several studies in the literature which show that naturally occurring mood states such as clinical depression generate sufficient emotional arousal in the memory network of adults to improve recall of congruently valenced emotional events (Bullington, 1991; Clark & Teasdale, 1985).

In contrast, there are only a few studies investigating mood induction techniques with children. One study used situational mood induction with their subjects. Two studies have shown imagery techniques to achieve a mood state in children and another tested three novel methods of mood induction, labelling the emotional state, forming a facial expression, and re-enacting the emotional state.

Bartlett and Santrock (1979) used short stories as a method of situational mood induction with five year old children. Children heard three happy stories or three sad stories. Each story had six emotional words, both happy and sad, subsumed in it. After hearing the stories children were asked to re-tell them. The dependent variable was the six critical words to be recalled, but the experimenter did not actively cue the children to the words. The results showed that both the happy and sad stories affected children's recall. Children who heard the happy story recalled more happy than sad words while children who heard the sad story recalled more

sad than happy words. The effect was weaker for the sad words in the sad stories compared to the effect of the happy words in the happy stories, but overall mood manipulation at encoding was shown to improve later recall of emotional items. So reading a story at encoding was shown to be a successful method of mood induction for happy, and to a lesser extent sad memories. However using a story at retrieval to induce a mood state and enhance recall of a past event (mood-state-dependent learning) would rely on the experimenter to choose a story matching the child's original mood type and mood intensity. As discussed, one danger of experimenter introduced cues is they may be seen as irrelevant by the child and cause bias and errors in recall.

Other studies have used imagery to induce a mood at retrieval and effect past recall. Imagery techniques allow the subject to generate their own emotional state by asking subjects to remember a life event with strong emotional connotations. In doing so subjects may be able to closely match the type and intensity of the emotional states at encoding and recall by choosing images that elicit similar emotional reactions.

Bartlett, Burleson and Santrock (1982) used imagery either with or without relaxation as a method of mood induction for a group of kindergarteners and a group of third graders. In experiment one children were asked to undergo a relaxation procedure and then imagine an experience that had previously made them feel happy or sad. In experiment two the relaxation procedure was omitted. In both experiments children were read a list of neutral words following the imagery task. An interference condition then followed in which children were asked to imagine an experience that induced the opposite mood, after which they learned a second list of words. Following a ten minute delay the children were asked to imagine a final

emotional experience which made them feel either happy or sad. Half the children were instructed to imagine the same type of experience as at encoding and half were instructed to imagine the opposite type. The children were then asked to recall as many items as they could from both lists. When relaxation was omitted recall was significantly enhanced by the mood states. Children recalled the most words from the list learned in the emotional state that matched their mood at retrieval. Children whose mood at retrieval was opposite to the mood at encoding recalled significantly fewer words from either of the lists.

Bartlett et al had hypothesised that relaxation would facilitate the process of mood induction but this was not found. Relaxation actually resulted in a milder mood being experienced by the children and consequently had no effect on recall. Bower (1981) suggested that a fairly intense emotional experience was required to activate the associated emotions in the memory network. By dampening the intensity of the mood using relaxation, the children's mood was not intense enough to activate associated memories to consciousness.

Nasby and Yando (1982) also used imagery as a method of mood induction to enhance children's recall. Fifth grade boys and girls imagined a personal experience that made the child feel either "really happy" or "really sad". They then learned a list of positive and negative words. The children's mood was manipulated again at retrieval to produce either a positive or negative mood by asking children to recall a second emotional event. The effects of mood at encoding and retrieval were examined separately. A happy mood compared to a neutral mood at encoding facilitated later recall of positive words. A happy mood during retrieval also facilitated recall of positive words. Nasby and Yando did not find a significant mood-state-dependency result since congruent encoding and retrieval moods did

not produce superior recall to when mood manipulation occurred only at encoding or retrieval. Provided either the encoding or the retrieval mood matched the items to be remembered, recall was enhanced, which provides support for mood-congruent learning. However this study showed children could use imagery to induce a mood state and effect recall.

These two studies showed imagery to be a useful tool for inducing a mood in children and improving their recall. However both the above studies only related to immediate recall. In clinical interviews the recall of recently learned items is not often of interest, as it is usually the recall of past events that is required. Liwag and Stein (1995) used three different methods of mood induction to test children's recall of events that had happened two weeks before.

Liwag and Stein (1995) investigated three and five year old children's ability to recall four different real life emotional events in which they had experienced either of happiness, sadness, anger and fear respectively. These events were obtained through previous interviews with the parents in which they were asked to recall four different situations over the past two weeks where they had observed their child experiencing each one of the four emotions. In the experimental interview children were asked to recall each event using either free recall (the control condition) or one of the three mood-induction techniques. In the first experimental condition the children were asked to simply identify and label the emotion they had experienced during the event and then recall the episode. For the second condition children were asked to identify their emotion and then to make a facial expression corresponding to that emotion before being asked to recall the event. In the third condition children were asked to identify their emotion, make a facial expression, and then to reinstate their original emotions as they recalled the event. Children in

this re-enactment condition were instructed to re-tell the event and to, "act like you are feeling (child's emotion *eg. happy*) just like you were when (precipitating event) happened." The third condition therefore included some aspects of imagery since children were required to imagine their original mood before acting it out. Like imagery, it also relied on the child's rather than the experimenter's perception of the emotional experience.

The children in the emotional reinstatement condition significantly outperformed the children in the other conditions on measures of recall. They recalled almost twice as many phrases relevant to the event compared to the children in the other experimental conditions. This occurred for the recall of happy, sad, angry and fearful memories, although children recalled significantly more information about happy memories. Emotional re-enactment did not appear to increase the number of the errors in children's recall although Liwag and Stein (1995) had no objective measure of accuracy so they could not address this issue directly. They compared the children's recall with that of their parent's recall of the same events. Thus the study only measured similarity in recall. This is an important limitation as it must be shown that any technique for improving children's recall does not also increase children's recall of inaccurate information.

Yet Liwag and Stein's (1995) study was the only study on children which approximated the conditions of a clinical interview. Children in Liwag and Stein's study were asked to recall a personally experienced event whereas other studies asked children to recall word lists rather than personal events. Learning a list would result in more intentional learning by children than would occur in a real life situation. In Liwag and Stein's study the learning was incidental and mood induction still enhanced children's recall for the event. The study's time frame for

recall also approximated clinical conditions where children were asked to recall an event which had occurred up to two weeks previously. This showed that when mood induction was achieved in children, it facilitated recall of long term rather than short term memories.

Finally the study introduced emotional re-enactment as a strategy that children could use to prompt their own memories by using their original emotional state as a cue. The imagery technique used by Bartlett et al (1982) and Nasby and Yando (1982) involved different imagined events being generated at encoding and retrieval. This must have resulted in an approximate match between emotional states at encoding and retrieval in the above studies since children's recall in the emotionally congruent conditions was increased. However using a related event to prompt a memory relies on the child's ability to choose an imaginary event which reflects both the type and intensity of mood for that memory. A more reliable method for activating the network would be to base the mood state on the original emotional state as was achieved through the re-enactment techniques of Liwag and Stein (1995).

Liwag and Stein found no support for the two other methods of mood induction. Neither having recreated the appropriate facial expression nor labelling the emotion they had previously experienced improved children's recall compared to the control group. Liwag and Stein suggested these two methods did not arouse a sufficiently intense mood state in their 3 and 5 year old subjects to enhance recall.

Although the study by Liwag and Stein (1995) did not find support for facial expression as a method of mood induction in children, they did not examine if there were age differences between 3 and 5 year old children. Huttenlocker and Smiley

(1990) showed that at about 2 1/2 years children began to describe other people as subjects of experience, and to understand that others have internal states similar to their own. Thus at 2 1/2 children are just learning to equate facial expressions with emotions. Stein and Levine (1989) maintain that age three is a time when children are rapidly developing concepts of self and of others, and a further understanding of the relation between internal and external concepts should develop along with this social knowledge. It is not until at least the age of four that children learn to reliably distinguish various emotional terms and express their knowledge about different emotional states (Stein & Levine, 1989). Thus a five year old may easily relate their facial expressions to emotions whereas a three year old might not be able to use expression to arouse internal emotional states.

There is support for facial expression as a method of mood induction in adults. Laird, Cuniff, Sheehan, Shulman and Strum (1991) instructed subjects to adopt a facial expression using a step-by-step procedure to avoid subjects guessing the purpose of the task. Once the facial expression had been constructed, subjects were presented with a neutral word, for example house, tree, or water and asked to recall a personal event of their choice. Subjects who posed in a smile later rated their memories and emotional state as positive and subjects who adopted an angry pose rated their memories and emotion as angry. This study showed that facial expression could trigger emotional memories in the subjects and might be applied to memory enhancement.

Laird, Wagener, Halal, and Szegda, (1982) directly investigated the effects of facial expression on recall by asking subjects to read either an anger-provoking editorial or a humorous selection by Woody Allen. Later one selection was recalled while frowning and the other while smiling. Recall was significantly better for the angry

editorials when frowning, and for the humorous selection while smiling. This study showed that for adults, facial expression induced a mood state which could effect recall.

So in adults facial expressions appears to be closely associated with emotional reactions. Although emotions usually generate facial expressions in everyday life, rather than vice versa, facial expressions have successfully been used to elicit emotional sensations and accompanying physiological change. Bower (1987) maintained that facial expression affects mood because the two are closely associated in the memory network. Although the study by Liwag & Stein (1995) found no facilitative effect for facial expression with children, they did not examine age differences between the three and five year olds. There may be a developmental shift in the ability to relate facial expressions to internal emotional states which occurs around four years of age. Therefore facial expression may be a method of mood induction that five year old children could use as a memory cue.

Limitations to the Effects of Mood on Memory

In the literature on mood-congruent memory, there is an asymmetry in the level of effect observed for positive and negative moods, with positive mood generally showing a stronger effect on the recall of mood-congruent memories (Blaney, 1986; Isen, 1984; Ucros, 1989). Adult memories are retrieved faster (Teasdale & Fogarty, 1979), and are richer (Salovey & Singer, 1991) when happiness rather than sadness is employed in mood-congruency studies.

The three studies examining the effects of mood on children's memory also reported an asymmetry in the results for positive and negative mood. Nasby and Yando

(1982) demonstrated a mood-congruent effect for recall by a group of 108 fifth grade boys and girls where mood induction was achieved through imagining a past happy or sad experience. If children were happy in the retrieval condition they recalled more happy than neutral or sad words, however sadness at retrieval did not result in more sad words being recalled. Liwag and Stein (1995) also reported happiness had the strongest effect on recall compared to sadness, anger and fear although the relative effects of each mood state were not reported. Bartlett and Santrock (1979) found the same asymmetry in their experiment on mood and learning in kindergarteners. Furthermore Bartlett et al (1982) found it was harder to successfully induce a sad mood than a happy mood in five year old children using stories.

Isen (1984) suggested sadness and other negative emotions do not enhance recall because most people try to avoid or defend against negative emotions and will resist using negative emotions as retrieval cues. To avoid experiencing sadness people tend to engage in "mood repair" which results in the cognitive and emotional experience of a negative mood being much more complex than that of a positive mood. There can be various behavioural consequences of negative mood, for instance negative mood may produce negative thoughts and emotional reactions through associations within the memory network. Alternatively neutral thoughts and emotions may arise as a result of the person attempting to overcome the negative mood with competing positive thoughts. Finally, if the attempt at "mood repair" is intense the original negative mood could even result in a positive cognitions and emotions. Since people resist negative emotional experiences the network associative connections between negative memories are likely to be weaker due to their reduced use and this may cause further difficulties at retrieval.

Consequently there are many difficulties associated with inducing negative moods in subjects. Negative moods may still enhance the recall of negative memories but the effect is likely to be weaker than for positive mood.

Summary and Hypotheses

When interviewing children about past events, adults may not be aware of what actually happened and rely on the child for their full understanding of the event. Therefore it is important that the child's account is both as complete and as accurate as possible. Unfortunately young children have difficulty supplying complete accounts in free recall conditions (Pipe et al, 1993). Since the interviewer may not know what actually happened, any cues introduced by the interviewer may be only marginally relevant to the child's memory for the event and therefore may bias their responses and increase errors (Dale et al, 1978; Saywitz et al, 1991). Thus there is a need to explore methods of cuing which the child can generate themselves so they are not biased by the experimenter's suggestions and the low error rates associated with free recall can be maintained.

Network theory maintains that the memory is an inter-connected network so that internally generated cues can be used to enhance recall from related parts of the network. Emotion has been found to be an effective memory cue with both adults (Ucross, 1989; Blaney, 1986) and children (Liwag & Stein, 1995; Bartlett et al, 1982; Nasby & Yando, 1982) with both able to induce an appropriate emotional state that appears to match the original emotional experience in category and intensity. Emotional congruence should not introduce errors to the child's recall because it does not rely on interaction between the child and the experimenter, since children can induce a mood state alone. Other reasons to use emotions as a cue to

improve children's memories of events when in a clinical setting are first, that there are thought to be a discrete set of emotions (Plutchik, 1980a; 1980b) so that subjects can easily isolate the category of their emotional experience. Second emotions are easily activated by individuals and once activated have a stronger effect on the network than other types of nodes (Gilligan & Bower, 1984).

One goal of the current research was to test the efficacy of emotional re-enactment to increase the amount of details children recalled about a real life event above what they provided through free recall. This technique was previously employed by Liwag and Stein (1995) and could be applied to clinical interviews with children. Emotional re-enactment relies on the child to generate his or her own mood and therefore should avoid contamination from the experimenter. Liwag and Stein (1995) reported that emotional re-enactment enhanced children's recall and the current study expected to replicate this finding. The main goal of the current research was to provide direct and objective measures of the accuracy of children's recall using emotional re-enactment as a retrieval strategy by employing a controlled event as the target for recall. If cues are to be used in clinical interviews they must be shown to maintain the accuracy of children's recall however this could not be achieved with the design used by Liwag and Stein.

A second method of mood-induction, forming a facial expression, was also tested in the current study to determine whether it had any effect on children's recall. Although Liwag and Stein (1995) did not find support for facial expression as a method of mood induction with a group of three and five year old children, there may have been age differences in this ability as many three year old children may not have fully developed an ability to relate facial expressions to their own internal emotional state. Five year old children may be able to use this strategy to prompt

their memories. This research investigated whether facial expression would improve five year old children's recall of a real-life event.

Twenty-six kindergarten children who had never before been asked to participate in a memory task were recruited from three primary schools in the Australian Capital Territory. Of the original 96 children who participated in the pre-test, 56 children, 23 males and 33 females, met all the pre-test criteria and participated in the experimental interview. These children ranged in age from 4.75 years to 6.5 years ($M = 5.50$, $SD = 0.34$). The large rate of exclusion from the experimental interview was mostly due to the child's having read the story previously. Thirty children were excluded from the experimental interview for this reason. The other children were excluded during the pre-test and experimental interviews.

The percentage of children whose parents consented to their participation in the study was very high amongst the schools, 85% (School A), 70% (School B), and 83% (School C).

Design

There were three levels of one independent variable, which was the visual strategy used (free recall, facial expression, and free recall + facial expression). The dependent variable was mean child's recall (total, false, and true) which was measured by breaking each narrative into 10 segments and asking the child to recall each segment against the original story.

Method

Subjects

Ninety-six kindergarten children who had received parental consent to participate were recruited from three primary schools in the Australian Capital Territory. Of the original 96 children who participated in the pre-test, 56 children, 28 males and 28 females, met all the pre-test criteria and participated in the experimental interview. These children ranged in age from 4.75 years to 6.5 years ($M = 5.50$, $SD = 0.34$). The large rate of exclusion from the experimental interview was mainly due to the children having read the story previously. Thirty children were excluded from the experimental interview for this reason. Ten other children were excluded during the pre-test and experimental interviews.

The percentage of children whose parents consented to their participation in the study was very high amongst the schools, 85% (School A), 70% (School B), and 83% (School C).

Design

There were three levels of one independent variable, which was the recall strategy used (free recall, facial expression, emotional re-enactment). The dependent variable was each child's recall (direct, associated, or non-informative) of a story which was measured by breaking each narrative into discrete clauses and comparing those against the original story.

Procedure

At Time 1, three days prior to the experimental interviews, a research assistant dressed in a clown suit arrived for a surprise visit to the kindergarten classroom. The clown showed the children some balloons which she had brought and set them aside for distribution at the end of the day by the teacher. The clown's visit and the gift of the balloons were designed to invoke a feeling of happiness in the children, so the clown acted in a friendly, cheerful manner throughout her stay in the classroom. She then chatted with the children as a group before sitting down to read the children the story, *Bamboozled* by David Legge. The story was chosen because of its silly and amusing pictures and text. This matching between the mood induced in the children and the emotional valence of the story was expected to facilitate encoding of the material as Bower (1981) showed that we attend to stimuli in our environment which match our current mood state. The children would attend to this "happy" story because it matched their "happy" state. There were a large number of unusual drawings on each page, so that a young child would have difficulty attending to every picture, and thereby reduce the likelihood of any child remembering the full story, thus avoiding ceiling effects in recall.

The story was read in an interactive fashion, so that the clown asked and encouraged the children to participate both verbally and physically in the story by identifying and pointing out two particular items from each page. The children's active involvement in the story was designed to closely approximate a real-life experience rather than a passive reading of the story. The clown stayed in the classroom for approximately 25 minutes and departed following the story.

Immediately following the clown's departure, the experimenter interviewed each child individually and administered a pre-test on emotion face-labelling to ascertain whether he/she could accurately label and differentiate their own internal emotions as well as engage in the mood induction techniques used in this study. Liwag and Stein (1995) conducted the pre-test just prior to their experimental interview so that it was unclear whether the pre-test had affected the emotional state of children in the control condition, who were presumed to be of neutral emotion. This problem was eliminated in the current study by conducting the pre-test three days before the experimental interview. In an effort to minimise priming or rehearsal effects related to the story, the children were not told they would be interviewed until after the story, at which point the experimenter indicated they would be asked about what they thought of the clown rather than the story. Each of the 96 children participated in the pre-test on emotion face-labelling.

Pre-test interview

The pre-test task was similar to that of Liwag and Stein (1995). Detailed instructions for the pre-test interview are in Appendix A. The experimenter provided four cards in random order, each with either a happy, sad, angry, or scared face drawn on it, and asked the children to label each face by pointing to it (eg. "Which of these is a happy face?"). The four emotions labels were presented in a counter-balanced order and are attached in Appendix B. This task ensured children could categorise and label distinct emotions.

Following the labelling of each emotion face, the children were encouraged to express the emotion themselves in order to test their ability to accurately express their internal emotional states through facial expressions. Children were asked,

"Can you show me what your face looks like when you're *emotion* (eg happy)?" Finally the child was asked to re-enact each emotion: "What do you look like when you are *emotion* (happy)?" If the child queried the second question the experimenter prompted further with "Show me something you do when you are *emotion* (eg happy)." The child was given time to respond following each question.

Children who did not succeed on all of the pre-test activities (emotion labelling, facial expression or emotional re-enactment) were engaged in two series of training for the activity they had failed. The training consisted of the experimenter modelling the activity to the child and asking them to try again. Of the 96 children who participated in the pre-test three received some training on the names of emotions and 17 received training on forming a facial expression. Sixty-four children were trained in re-enacting the emotion. These children appeared to not understand the verbal instructions since the majority of these children succeeded at the task following a single modelling of the activity by the experimenter.

To meet the criteria for inclusion in the experiment, the children had to label the four emotion faces correctly as well as display a facial expression compatible with each emotion (for example a smile when asked to show a happy face). Children who could not do these tasks after two series of training were excluded from the experimental interview. All the children met the criteria for face labelling. Only two children did not meet the criteria for forming a facial expression which was judged using the criteria of the Facial Action Coding System, developed to categorise and label facial expressions (Ekman & Friesen, 1975). Despite the two series of training, one child could not form a sad facial expression while the other could not produce an angry face and these subjects were excluded from the experimental interview. The emotional re-enactment task was not judged as a

criterion for inclusion in the experiment, instead children were encouraged to play-act, and the experimenter asked throughout, "How do you feel? Do you feel (happy)?" to ensure they had achieved the appropriate emotional state. All children reported feeling happy during the emotional re-enactment task.

At the conclusion of the pre-test interview each child was asked to identify how they had felt when they heard the story, as well as how they felt when the clown visited, to ascertain his/her emotion at the time of encoding the stimulus material. Any child who responded to either of these questions with an answer other than "happy", was excluded from the experimental interview since this study focused only on the effects of positive mood on memory; negative mood induction having been shown to have a complex effect on emotional states and recall (Isen, 1984; Bartlett et al, 1982; Nasby & Yando, 1982). Four children were excluded from the experimental interview based on this criteria since three children reported the story made them angry while one child reported that the clown made him angry. Overall 96% of the children responded that they had felt "happy" indicating that the clown, balloons and the story successfully induced a happy mood in the majority of the subjects .

Finally children were asked whether they had previously heard or read the story and if so, were excluded from the experimental interview. This ensured that all children were recalling a novel event. Thirty children stated they had previously heard someone read them the story, most having heard it at pre-school the year before.

Experimental interview

At Time 2, three days following the clown's visit and reading of the story, the experimenter re-visited the classroom and administered the experimental interview. All children who met the pre-test criteria took part in the experimental interview which was conducted individually with each child and audio taped by the experimenter. Children were randomly assigned to one of the three retrieval conditions. Detailed instructions for conducting the experimental interview are attached in Appendix C.

The interviewer first asked whether each child remembered the day when the clown visited and read the story. All the children interviewed remembered both the visit and the story. The children were subsequently given specific instructions about the way in which the event was to be recalled according to their experimental condition. Twenty children were initially allocated to each condition and the instructions for each were based on the method employed by Liwag and Stein (1995).

Condition 1 (Control Condition/Free Recall Condition): In this condition children were asked to freely recall as much of the story as possible. Whenever a child paused they were asked, "Can you remember anything else?" until the child remembered nothing further.

Condition 2 (Facial Expression Condition): In this condition, each child was asked to tell the experimenter how they felt when they heard the story. The child was then asked to make a facial expression corresponding to that emotion after which he/she received the same recall instructions as in Condition 1.

Condition 3 (Emotion Reinstatement Condition): In this condition, each child was asked how he/she felt during the story and to make a facial expression that corresponded to the emotion as in Condition 2. After this each child was instructed to attempt a reinstatement of his/her original emotion and asked to recall the event as they did so. The instructions given for this were:

Now can you tell me exactly what happened in the story? Try to remember what it feels like to be happy just like when you heard the story. Now try to remember what happened in the story. Pretend to be happy and at the same time tell me the story. Tell me as much as you can remember.

Children in all three conditions were then presented with four probe questions after they had exhausted their free recall of the story. The order of the probe questions for this condition was as follows:

Probes:

1. Thoughts: What did you think about when this happened?
2. Actions: What did you do?
3. How did the story end?
4. Can you remember anything else about the story or the day the clown visited?

Following each response the child was asked "Can you remember anything else?" until the child remembered nothing further.

The first two probes were employed by Liwag and Stein (1995) to stimulate the children's memories of their thoughts and actions during the event to further trigger associated memories of the event. The third question replaced a probe question

used by Stein and Liwag which asked children to identify their feelings during the event. That question was excluded from the current study because of the possible interference of emotions on the control condition. The replacement question was chosen because it maintained the length of the interview without adding suggestive material and because it is a commonly used question in investigative interviews with children (Gieselman, Saywitz & Bornstein, 1993). The final question was included in this study, as it was in the Liwag and Stein (1995) study, to allow each child every opportunity to respond and be stimulated by the first three questions. Overall the probes also served to increase the duration of the experimental interview since longer interviews have been associated with stronger mood effects (Ucross, 1989).

Of the 60 children who had been assigned to experimental conditions, four were excluded from the final results. Two children were not present on the day of testing. One child who initially denied having heard the story, stated during the experimental interview that he had heard the story previously. The fourth child was excluded because of extreme distractions during her interview. This resulted in 17 subjects in Condition 1, 20 subjects in Condition 2, and 19 subjects in Condition 3.

Results

Coding of Responses

The data consisted of the 56 children's full narratives for the experimental event. A narrative consisted of each child's response to the free recall question and the four probe questions. The children's responses were transcribed and later coded by both the experimenter and an assistant according to the categories outlined by Liwag and Stein (1995). The full coding rules are attached in Appendix A.

Clausal units

To analyse the children's recall, each narrative was first broken down into clausal units. A clausal unit equated to a simple sentence or idea, and was roughly defined by the presence of a noun and verb.

Informative versus non-informative clausal units

Each clause was then classified as either an informative or non-informative unit. Informative clauses were defined as those which related to the story or to the day the clown visited. Informative clauses also included impressions of the story, and memories of other events related to either the story or the clown's visit.

Non-informative clauses consisted of responses that were unrelated to the story or the clown's visit. These included off-task verbalisations (eg. "Let me play with the tape-player"), non-sensible comments (eg. "He was.. " "Hmm"), unintelligible speech, spontaneous repetitions made by the child and non-spontaneous repetitions

requested by the interviewer when the child's response was unclear. If children responded with information that was included in one of the questions then it was also considered non-informative (eg. "The girl visited her Granddad's house" was coded as non-informative because the children were instructed to recall "the story where a little girl visited her Granddad's house").

Informative clauses represented the overall quantity of relevant phrases each child recalled while non-informative clauses represented off-task responses. The mean recall of informative clauses by all the children in the experiment ($M = 12.30$ $SD = 5.69$) was significantly different from their mean recall of non-informative clauses ($M = 2.04$ $SD = 2.00$; $t_{110} = 12.75$, $p < .05$). Children's responses showed that they attended to the experimental questions and focused on the task at hand.

Direct versus associative clauses

To measure the accuracy of each child's recall, each informative clause was further defined as either direct or associative. Direct clauses consisted of responses which were directly related to the story and correct in content. Direct clauses were considered to be accurate representations of the story details and did not include inaccurate details.

Associative clauses were defined as those which related to the reading of the story but not directly to the story content (eg. "The clown had orange hair." or "My friend was pulling my hair"). Those statements which were associated in the child's mind with the event were also included ("My balloon's still at home") as were impressions of the story or the clown (eg. "The story was funny"). Any incorrect memories of the story were also counted as associative information.

Each child's narrative was scored independently by a pair of coders. Clauses were classified according to the five categories (in brackets) and the raters' total scores for each category of clause was compared for each child. The existence of a clause was defined by each coder and as such there was no guarantee that the basic units of text were judged identical. Correlations for each coding pair were calculated using Pearson's r and were $r = .98$ (total clauses), $.99$ (informative clauses), $.99$ (non-informative clauses), $.99$ (direct clauses), $.99$ (associative clauses) suggesting there was substantial agreement between the two coders. Any discrepancies in the coding were resolved through discussion between the two coders.

Comparison of Recall Conditions

To examine the effects of the emotional retrieval conditions on children's recall, a 3 x 3 analysis of variance was conducted with the retrieval conditions (control, facial expression and emotional re-enactment) as the between-groups variable, and the category of clauses recalled by each child (direct clauses, associative clauses and non-informative clauses) as the within-subjects variable.

There was a significant interaction between the retrieval condition and the category of clauses recalled by the children ($F_{4,106} = 3.49$, $MSE = 6.32$, $p < .01$). Analysis of main effects revealed a significant effect for the retrieval conditions ($F_{2,53} = 4.24$, $MSE = 12.92$, $p < .05$) and for the category of clauses recalled, $F_{2,106}$, $MSE = 6.32$, $p < .05$).

Figure 1 shows the interaction between the three retrieval conditions and the three clause categories (direct, associative and non-informative). The means (with

standard deviations in parentheses) for children's recall in the control, facial expression and emotional re-enactment conditions of direct clauses were 4.71 ($SD = 2.17$), 6.95 ($SD = 3.38$), and 9.16 ($SD = 4.02$) respectively; for associative clauses they were, 5.18 ($SD = 4.02$), 5.05 ($SD = 3.20$), and 5.58 ($SD = 2.52$) respectively; and for non-informative clauses they were 1.76 ($SD = 1.34$), 1.55 ($SD = 1.70$), and 2.79 ($SD = 2.55$) respectively. Analysis of simple main effects revealed significant treatment effects for direct recall only, $F_{2,106} = 19.22$, $p < .05$. Post-hoc comparison analysis of direct recall using the Newman-Keuls statistic for ordered means revealed that the emotional re-enactment condition elicited significantly more recall of direct clauses than either the control condition or the facial expression condition ($W_2 = 2.21$, $p < .05$). Facial expression did not result in a significant improvement in recall of direct clauses when compared to the control condition ($W_5 = 2.24$, $p > .05$).

There were also significant simple main effects for the category of recall at each of the three treatment levels, $F_{2,106} = 7.13$, $MSE = 6.32$, $p < .05$ for the control group, $F_{2,106} = 25.59$, $MSE = 6.32$, $p < .05$ for the facial expression group, and $F_{2,106} = 30.64$, $MSE = 6.32$, $p < .05$ for the emotional re-enactment group. Newman-Keuls tests revealed that recall of associative or direct clauses was significantly higher in all three experimental conditions than recall of non-informative, $W_5 = 3.42$, $p < .05$ for controls, $W_5 = 3.59$, $p < .05$ for the facial expression condition, and $W_5 = 2.79$, $p < .05$ for the emotional re-enactment condition. The amount of direct clauses recalled by children did not differ from the amount of associative clauses recalled except in the emotional re-enactment condition where children's recall of direct clauses was significantly greater than for associative clauses, $W_3 = 3.58$, $p < .05$.

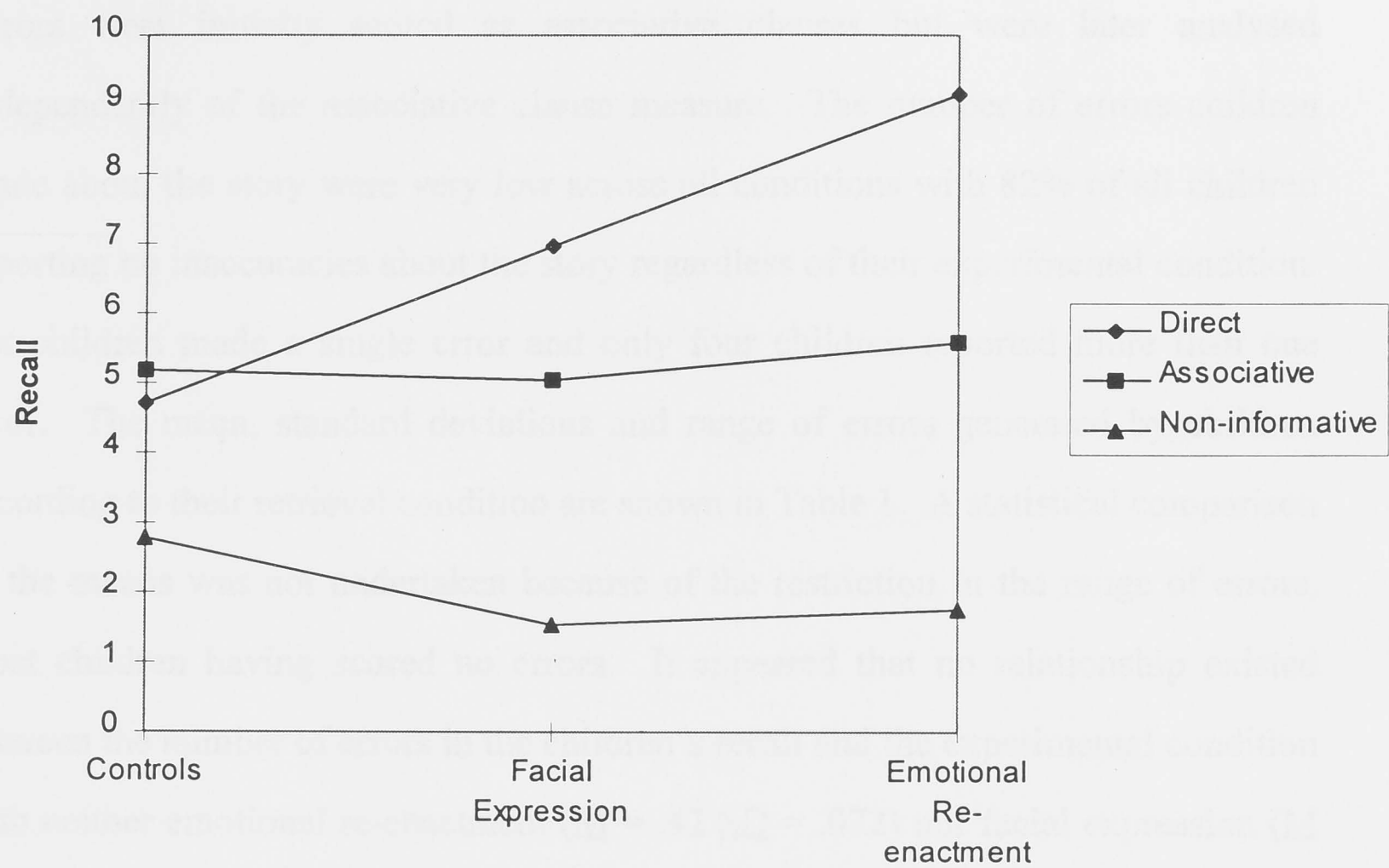


Figure 2: Mean recall of direct, associative and non-informative data according to experimental condition

Errors

Errors were initially scored as associative clauses but were later analysed independently of the associative clause measure. The number of errors children made about the story were very low across all conditions with 82% of all children reporting no inaccuracies about the story regardless of their experimental condition. Six children made a single error and only four children reported more than one error. The mean, standard deviations and range of errors generated by children according to their retrieval condition are shown in Table 1. A statistical comparison of the means was not undertaken because of the restriction in the range of errors, most children having scored no errors. It appeared that no relationship existed between the number of errors in the children's recall and the experimental condition with neither emotional re-enactment ($M = .42$ $SD = .072$) nor facial expression ($M = .20$ $SD = .084$) inflating the number of errors in the children's recall relative to the controls ($M = .47$ $SD = .13$).

Error rates were calculated with errors as a percentage of accurate recall (direct clauses). Table 1 shows the error rates for the three experimental conditions and indicates that children's errors accounted for a small proportion of recall ranging from an error rate of 3.18% for the facial expression to 4.66% for controls. The error rate for the emotional re-enactment condition was not higher than the rate for controls.

Table 1
Mean Errors and Error Rates in Direct Recall according to Experimental Condition

	<i>n</i>	Mean Errors	<i>SD</i>	Range of Number of Errors	Error Rate (%)
Control Condition	17	.47	.13	0-6	4.66
Facial Expression Condition	20	.20	.084	0-2	3.18
Emotional Re-enactment Condition	19	.42	.072	0-4	3.19

Discussion

Effects of Mood Induction Techniques on Accurate Recall

Emotional re-enactment improved children's recall of accurate details without increasing the number of inaccuracies in children's reports when compared to controls. Facial Expression had no effect on children's recall of the story compared to controls.

Emotional re-enactment

The hypothesis that emotional re-enactment would improve children's recall of accurate details about a real-life emotional event was supported. Children who engaged in emotional re-enactment of their original happy mood recalled significantly more accurate information (ie. direct clauses) about the story compared to those children in the control group. Children in the control group only recalled on average four clauses about the story supporting earlier findings that children have difficulty in providing lengthy responses in a free recall paradigm (Pipe et al, 1993). Whereas children in the emotional re-enactment condition recalled on average eight accurate clauses about the story, twice the recall of controls. These results were consistent with the findings of Liwag and Stein (1995) who also reported that emotional re-enactment increased children's recall about past events.

Furthermore recall of accurate information (direct clauses) by children in the emotional re-enactment condition was significantly higher than their recall of related information (associative clauses) showing the children were able to use

emotional re-enactment to improve their recall of the central event. Children in the control condition recalled roughly the same amount of direct as associative clauses showing they lacked strategies to direct their retrieval towards the event in question. Liwag and Stein also reported that emotional re-enactment resulted in more focused and directed narratives by children about the everyday events they had experienced. They suggested the cues from emotional re-enactment assisted children to sequence and organise their recall. Young children would otherwise rely on adults for such direction. The results of this study showing children recalled more direct clauses using emotional re-enactment, were consistent with the results of Liwag and Stein.

Of equal importance was the finding that emotional re-enactment increased children's accurate recall without inflating the level of errors in their recall. In all conditions children made few errors supporting previous findings that young children's free recall is highly accurate (Dent & Stephenson, 1979; Pipe et al, 1993). However children in the emotional re-enactment condition recalled substantially more details about the event without making any additional errors when compared to children in the control group. This was true when the actual number of errors for each condition were considered as well as when error rates were considered. This was an important finding because other cuing techniques aimed at enhancing recall, such as presenting verbal cues or visual props to children, have been shown to also increase the number of errors and error rates in children's recall (Dale et al, 1978; Saywitz et al, 1991). Such experimenter-provided cues and props introduce suggestions to the child about what they should remember and therefore bias their recall and create errors in their reports. Emotional re-enactment achieved the aim of enhancing recall without introducing suggestions to children's retrieval by allowing children to identify and generate their own cue, the emotional state.

Rather than being presented with a cue chosen by the experimenter, children were shown a strategy which they were then able to use to self-cue their memories.

Children could use emotional re-enactment to induce a mood state of appropriate type and intensity to enhance their recall of a particular event and this provided evidence for mood-state dependent memory in young children. Had the type and intensity of the original mood state not been matched at retrieval, children's recall of the story would not have been enhanced. Their mood at retrieval may have enhanced their recall of other events and errors in recall would have risen. Previous studies had shown that young children could also use imagery techniques to induce a mood state and improve their recall of newly learned information (Bartlett et al, 1982; Nasby & Yando, 1982). Taken together with the results of Liwag and Stein (1995) the current research showed great support for the concept of mood state-dependent learning and also Network theory in young children.

Despite these results supporting mood-state-dependent memory and Network theory in children, in recent papers Bower (1987; Bower & Mayer, 1989) stated that since his early hypnosis studies (Bower, 1981; Bower et al, 1978) he had not been able to replicate the findings of mood-state-dependent memory using the traditional list-learning task with hypnosis as a mood induction technique. In reviewing his colleagues' and his own experiments with adults, he reported substantial support for other aspects of his Network theory but not for mood-state-dependent learning. He suggested that the mood-state dependent learning effect might only occur when the subject attributed his/her emotional state as being caused by the event in question (causal belongingness). Such an attribution would create strong network connections between the emotion and the event narrative. Bower maintained that unless the emotional state was perceived as an integral part of the event it would not

be connected to that event within the network. In a traditional list learning experiment, for example, where a mood is induced via hypnosis prior to the learning task, the subject may not attribute their mood to the event of learning the list and therefore not create connections between emotion nodes and concept nodes in the network. Thus mood-state-dependent learning would not occur.

To test the causal belongingness hypothesis Bower (1989) used happy or sad music combined with emotional sentences to induce a mood state in adult subjects. Subjects were asked to imagine they were reliving the event in the sentence to ensure they attributed their mood state to the sentence. An example of a happy event was "You're walking along the street and find a \$20 bill. You think of something unusual and pleasant to treat yourself with." Subjects alternated between reading happy and sad blocks of sentences, for example a subject may have read one block of eight happy sentences, followed by a rest period where the subject returned to a neutral mood state, and then read a block of eight sad sentences. Subjects were presented with four blocks, either happy-sad-happy-sad or the reverse order. Subjects' recall was then tested in either a happy or sad mood and a significant mood-state-dependent retrieval effect emerged. Subjects who learned the sentences when they were happy recalled significantly more happy episodes than sad episodes and subjects who learned the sentences when they were sad recalled more sad episodes than happy episodes. As Bower predicted when causal belongingness was achieved, the mood-state-dependent learning effect was found. However Bower reported that subsequent attempts to achieve causal belongingness had not been successful since not all subjects could induce alternating mood states as was required by his procedure, and a replication of the experiment did not find the mood-state-dependent effect on retrieval. He concluded that "mood-dependent

retrieval using laboratory-induced moods is an evanescent and unreliable phenomenon." (1989, p. 453).

Possibly causal belongingness is very difficult to achieve in a laboratory setting because subjects create an emotional state with no obvious cues to elicit the emotion. It might be easier to achieve in an experimental design presented within our everyday context. Especially since in real-life situations, a person's emotional state is commonly a reaction to an event, so that causal belongingness is likely to be achieved. The current study used a real-life happy event (the clown's visit) as well as a happy story to induce the children's mood at encoding. This was shown to achieve causal belongingness since 96% of children reported that the story and the clown visit made them happy. Liwag and Stein would have also achieved causal belongingness in their study since they achieved mood induction using children's own emotional reactions to real events. Future research might better test this hypothesis by using real-life designs. However these studies provide clear evidence for mood-state-dependent effects with recall of real-life events.

Facial expression

Forming a facial expression did not improve children's recall of the event, and this finding was contrary to the studies which have shown facial expression can achieve mood induction and improve recall in adults (Laird et al, 1982). However the current results replicated the findings for children reported by Liwag and Stein (1995) where three and five year old children could not use facial expression as a strategy to improve memory. Network theory would maintain that the emotional arousal from facial expression may have achieved the right type of mood ie. happy,

but was not intense enough to enhance the children's memories of the specific event.

The discrepancy in the effects of facial expression on adults' and children's recall might be explained in terms of developing emotional awareness. Despite five year old children's rapidly increasing social awareness (Stein & Levine, 1989) these children may only be beginning to relate an external facial expression to their own internal emotional state and thus have not yet developed strong network associations between their memories of facial expressions and their emotion nodes in the semantic network. Because of the lack of associative connections, forming a facial expression alone, would not adequately arouse the emotion nodes and therefore would not enhance the memory of the event. The results suggested that five year old children required a more direct method of activating the network emotion nodes than forming a facial expression and also showed that facial expression alone was not an adequate method of mood induction for these young children.

The discrepancy might also be related to the finding that even in adults, a large number of subjects could not use facial expression to induce a mood (Laird et al, 1982). The discrepancy could therefore represent individual differences rather than represent developmental differences. Some children in this study may not have been able to use facial expression to make themselves happy.

The finding that facial expression did not increase children's recall about the story showed that this part of the experimental instructions did not affect the children's performance in the emotional re-enactment condition. Therefore the re-enactment

of the emotional state (happiness) rather than the act of smiling, elicited the improved recall shown by those in the re-enactment condition.

Overall facial expression did not improve children's recall of the story. Future research may determine whether this is due to developmental differences between children and adults or differences in all individuals' abilities to use facial expression as a method of mood induction.

Effects of Mood Induction Techniques on Recall of Related and Non-Related Information

Facial expression had no effect on children's recall of either non-informative or associative clauses. Overall facial expression had no effect on any of the categories of recall compared to controls.

Emotional re-enactment also had no effect on children's recall of non-informative clauses. Children could pretend and act out their emotions without being silly or engaging in off-task behaviour. This finding supported the results of Liwag and Stein (1995) who also showed that emotional re-enactment had no effect on the children's recall of unrelated or off-task comments. Together the findings show that young children can engage in the process of emotional re-enactment while still staying focused on the task of retrieval.

Children's recall of associative clauses (or related information) was also unaffected by emotional re-enactment. This was contrary to Bower's concept of spreading activation (Bower, 1981;1987). Bower proposed that activation spreads across the network via inter-linked connections, arousing concepts about the event as well as

numerous concepts related to the original cue(s). Recall of the event in question should be enhanced by an emotional cue but so should the recall of related events. This finding was also contrary to the findings of Liwag and Stein (1995) who reported that the children in their study who engaged in emotional re-enactment, not only increased their recall of the direct event but also of related events.

There are two explanations which may account for the discrepancy in results between the current study and the theoretical prediction of spreading activation as well as the reported findings of Liwag and Stein (1995). One explanation for the current result is that the network arousal due to the emotional re-enactment was sufficient to boost the activation of directly related concepts and bring them into conscious awareness, but insufficient to arouse the nodes of associated events. This explanation assumes that the emotional re-enactment only induced a low intensity happy mood in the children causing a low level of arousal in the general network (Gilligan & Bower, 1984). Because activation dissipates as it spreads, a cue with a low level of arousal may only arouse a few direct connections before it fades. However in the current study this explanation appears unlikely, because of the large improvement in recall shown by those in the re-enactment condition. This suggested that the activation from the emotion cues was strong and therefore should have spread along many connecting pathways.

A second explanation for the discrepancy in findings for associative memories pertains to the novelty of the event recalled by the children in this study. In the current study the event involved a clown visiting the classroom and reading a funny story. This may have been an unusual and therefore very specific event in the young children's memories. Furthermore, excluding children who had heard the story previously, ensured the story was a novel event for all children in the study.

In contrast Liwag and Stein asked children to recall regular everyday events where their parents had recently observed them to express particular emotions. For happiness these prototypic events consisted of such instances as the child engaging in or mastering an event, getting a desired object, or participating in a family activity. Such events of an everyday nature might be commonly repeated occurrences for a young child, unlike the event in this study, and there is some evidence to show that young children are likely to remember repeated events differently to novel events.

Powell and Thomson (1996) showed that four and five year old children have difficulty remembering a specific occurrence of a repeated events. Children in their study were asked to relate a specific instance from a series of six classroom activities. For example all six activities involved the children sitting on a mat, however sometimes the children sat on small individual mats and other times they all sat together on a large sheet. Another example of the variation was that the activity always involved constructing a puzzle, but the puzzle varied and was sometimes a clown, sometimes a bird. When children were asked to recall a particular episode they had difficulty reporting details which were specific to the particular event in question. Instead they confused the specific event with the other similar events and related many items of a general nature that were common features of all six events. For example when reporting about how they sat, children might become confused as to whether they sat on a small or large mat. Furthermore children confused the specific details and reported some details as belonging to one activity when they actually occurred during other activities. For example, reporting they had completed the clown puzzle on a day when they had in fact completed the bird puzzle.

Powell and Thomson (1996) explained this finding in terms of script theory which maintains that schema exist in the memories and help to categorise events. After one experience a child has no schema for an event and it is stored as a single event in the network with connections between the specific features of that event. After several repetitions of an event however, a cohesive representation forms from the overlapping features of the events. The emergence of the schema implies that some details specific to a single event will eventually become lost as the connections between these details become comparatively weaker than connections within the over-riding schema. However the schema also results in a stronger memory trace for the prototypic details which will then be easily remembered. When a child is asked to recall a specific instance of a repeated event they would be likely to recall the prototypic details, some of which will correctly relate to the event in question. However some details that are prototypic will actually be about other events, but will be recalled by the child since the connections between the prototypic items are strong. On the other hand when a child is asked to recall a novel event the specific features of the event should be more easily recalled because a schema has not yet developed, while few associated events exist and are therefore unlikely to be recalled.

This explanation is consistent with Network theory (Bower, 1981) which maintains that pathways between nodes or items in an event become strengthened with repeated use so that the common features of a repeated occurrence will be more strongly connected to each event than specific or unusual features. This explanation also accounts for the findings of Liwag and Stein where children were asked to recall a number of common events. When those children's recall of the direct event was enhanced through emotional re-enactment, their recall of related events was also enhanced. In the current study the event of the clown visit, because

of its uniqueness, may have been a clearly defined event in the network but quite loosely associated to other events and unable to arouse associated memories. Thus for a novel event it might be expected that information about the event would be readily recalled without any effect on the recall of other related events as occurred in this study. Whereas for common events it would be expected that the recall of the event in question would also elicit memories of related events.

Clinical Implications

Since emotional re-enactment improved children's recall without affecting the number of errors they made, emotional re-enactment would be a useful tool for clinical interviews, especially with young children who require strategies to guide their re-telling of an experience. All the children in this study were ultimately able to use this strategy to induce a mood state. Most required some training to encourage the acting process but the majority succeeded at the task following a single training session in re-enactment. All the children were able to pretend to be happy and all reported feeling happy, which showed they had been able to use the re-enactment procedure to induce a happy mood. Based on this study, emotional re-enactment should be useful with most young children and by using this technique in clinical interviews, a clinician would expect a fuller account from a child who engaged in emotional re-enactment than a child who was asked to provide free recall only.

Although more evidence is required of this technique with other emotions and more complex events, emotional re-enactment might also be useful in conducting investigative interviews with young children since emotional re-enactment had no effect on the number of errors made by children in this study. As witnesses,

children may be called upon to testify about events such as murder, domestic violence and serious accidents. As victims, children may testify concerning sexual and/or physical abuse (Miller & Fremouw, 1995). In these circumstances there is a premium on accurate recall with a view to minimising errors where possible and this technique achieved both these goals for happy emotions with the children in this study. This study did not investigate the effect of emotional re-enactment on children's recall of negative events, however this does not preclude the use of emotional re-enactment for investigative interviews since in some of the above instances children's emotional state may not be negative, for example in incidents of sexual abuse young children's experience is not always negative (Lamb, Sternberg & Esplin, 1994). However some investigative interviews will concern situations which have been unpleasant for the child and future research must endeavour to show the value of this strategy with negative emotional experiences.

In considering this technique with investigative and clinical interviews, it should be acknowledged that emotional re-enactment and other forms of mood induction should never be considered for extremely negative events which may have involved severe trauma for the child, or repeated traumatic events such as chronic sexual abuse. First, trauma affects a child's ability to tell what has happened (Bentovim, Bentovim, Vizard & Wiseman, 1995). When asked to discuss such events some children become agitated and aroused and attempt to avoid the topic of the event. Emotional re-enactment requires the child to re-live the emotional experience and traumatised children may not be able to engage in such a task. Second, Van der Kolk and Fisler (1995) maintained that repeated traumatic experiences are likely to be encoded in a different form to normal emotional experiences. Children can dissociate from traumatic events so that the sensory and emotional experiences may become disconnected from the verbal narrative at

encoding. Thus the emotional and verbal nodes are not inter-woven in a network and cannot be used to trigger each other. For cases where the event in question is likely to have been extremely traumatic for the child, encouraging the child to engage in emotional re-enactment should not be considered. Of course not all negative events are experienced by children as traumatic and a sensitive clinician or interviewer should be able to discern from the child as well as the reports of the parents and other adults, when such a technique might be warranted.

In considering the effects of manipulating emotion to enhance children's recall some consideration should be given as to how naturally occurring mood states might affect recall, even when mood manipulation does not occur. Naturally occurring moods have been shown to affect adult attention and learning. Both clinically depressed adults and mildly depressed college students were shown to recall more negative items than non-depressed adults (Bullington, 1991). Naturally occurring moods have not yet been investigated with young children in terms of effects on recall however since self-induced moods were shown to affect recall in this study and others, it follows naturally occurring moods would also affect recall. A child's natural mood state may be advantageous in some instances where the child is asked to discuss an emotional event which matches his or her current mood. However a contrasting mood state could impede discussion of emotional material and events (Bower et al, 1978). Thus the interviewer needs to be aware of the child's current mood and how it will impact on their recall to avoid, for example, inadvertently inducing a happy mood in the waiting room before discussing a sad event in the interview room. Neutrality of mood may be preferred.

Some consideration should also be given as to how best to use the emotional re-enactment strategy with children. It might be employed as an interview strategy on

its own given the substantive improvement in recall shown by the children in this study. A number of researchers have discussed guidelines for investigative interviews with children which aim to reduce bias from the interviewer and errors in recall. However these guidelines lack strategies aimed at directly enhancing recall. Such guidelines have included building rapport (McGough & Warren, 1994; Wood, McClure & Birch, 1996); establishing ground rules for the interview, eg. Informing the child that it is all right to say "I don't know" (McGough & Warren, 1994); conducting a practice interview (Gieselman, Saywitz & Bornstein, 1993; Yuille, Hunter, Joffe & Zaparniuk, 1993); and employing open-ended questions where possible, using specific questions only after free recall is exhausted (Gieselman et al, 1993; McGough & Warren, 1994; Wood et al, 1996, 1996; Yuille et, 1994). Emotional re-enactment could be incorporated with these guidelines since it would not inflate errors but would add to the amount of recall normally provided by children in the free recall portion of their interview.

Since emotional re-enactment might not be useful for recalling all types of events, an interviewer might prefer to form a set of available techniques which incorporates emotional re-enactment. A set of techniques could then be adapted to suit the individual needs of the child and the circumstances surrounding the event. However despite the considerable literature emphasising the potential distortions in child testimony, few researchers have investigated strategies to enhance recall and reduce the reliance on verbal questions which have been shown to foster elaboration but risk distortion.

One formalised interview procedure, the Cognitive Interview (Gieselman et al, 1984) presents a number of mnemonic strategies in an ordered protocol for interviewing. The Cognitive Interview was initially developed to improve adult

memories (Gieselman et al, 1984) but has recently been found to increase children's recall of events without an accompanied increase in incorrect detail (Gieselman, Saywitz & Bornstein, 1993). Like Network theory the cognitive interview adopts the assumption that the effectiveness of any technique to access a memory is related to the extent of overlap between the features of the retrieval technique and the features comprising the memory. The Cognitive Interview further assumes that when information cannot be accessed by one retrieval technique, it may be accessible with a different technique or cue. The Cognitive Interview adopts four general interview techniques: (1) mentally reconstructing or visualising the event (2) reporting everything, even partial information, regardless of the perceived importance (3) recounting the event in a variety of orders, for instance backwards instead of forwards and (4) reporting the event from a variety of perspectives. A child would be asked to engage in each of these strategies in sequence followed by more specific questions to facilitate the recall of details, for example, "Did the person remind you of anyone you know?" A practice interview about a neutral event using the above techniques is always conducted prior to the investigative interview in order to build rapport with the child, familiarise the child with the interview process and to provide a base rate for the child's language abilities and narrative styles.

Gieselman et al (1993) showed the cognitive interview enhanced free recall for both 8 and 9 year olds as well as 11 and 12 year old children. Children observed a slide show and encountered three adults in conjunction with this: the experimenter, the slide show operator and a "surfer dude" who wandered into the children's waiting room following the slide show. The children were later interviewed about the slide show as well as the waiting room experience by detectives from the Los Angeles County Sheriff's Department who had been trained with the interview procedure.

Although there was some variation as to how closely the detectives followed the interview protocol, the results showed that all children interviewed with the Cognitive Interview recalled significantly more correct facts than controls without any significant increase in the number of incorrect items generated.

Emotional re-enactment could be used in conjunction with this interview by replacing the first recall strategy, mental reconstruction or visualisation of the event where appropriate. Using emotional re-enactment prior to the other mnemonic strategies could have a strong effect on retrieval since Network theory maintains that emotional arousal in the network is maintained longer than arousal from other types of arousal, including visual cues (Gilligan and Bower, 1984). Thus the arousal of the network created by emotional re-enactment might be maintained while the other mnemonic strategies are employed. The additive effects of this activation could arouse many more memories into conscious awareness than each of the strategies alone although this needs to be further investigated.

One criticism of the cognitive interview technique however is that there is no research to investigate the utility of this technique with children aged younger than eight. Furthermore in the above study (Gieselmann et al, 1993) the eight and nine year old children had less success with using some of the specific question techniques than the older children, for instance asking children if one of the people mentioned reminded them of someone they know. It is unclear how useful such techniques would be with even younger children, though some authors have speculated that younger children would have more difficulty with some of the techniques, for example reporting the event from a number of perspectives (McGough & Warren, 1994). However one value of the cognitive interview is the variety of non-suggestive strategies developed to offer the interviewer and the child

options in exploring memory strategies. Emotion may not be a useful cue for all children nor all events and in such cases the cognitive interview would provide alternatives.

The second interview technique discussed in the literature is the Narrative Elaboration Process (Saywitz, Snyder & Lamphear, 1996). Like the Cognitive Interview, this technique teaches children strategies to structure their own recall. However the cognitive interview still relies on numerous verbalisations from the interviewer while the Narrative Elaboration Process teaches children to use visual cue cards as symbols for verbal cues to further minimise verbal exchanges. This technique directly addresses young children's reliance on adults for cues such as *who*, *what*, *when*, *where*, *how* and *why* (Hudson, 1990). It does this by providing these prompts in the form of visual symbols on five cue cards. For example a stick figure represents participants and prompts the child to consider *who* was present. Other figures represent the setting (*where*), actions (*how*), consequences (*what*) and conversation/affective state (*why*). Prior to the interview children are trained in the meaning of the five symbolic cue cards which are then presented at the conclusion of the investigative interview as reminders.

In two studies (Saywitz et al, 1996; Saywitz & Snyder reported in Saywitz et al, 1996) the Narrative Elaboration Process was shown to increase children's recall without any associated increase in errors. Saywitz et al (1996) used this technique with seven year old children and tested the effects of this process on both free recall and cued recall (using the reminder cards). A classroom of second grade children had a "student teacher" run one of the daily lessons. Two weeks later half the students were trained in using the cards as reminder signs for other memories while half received a control interview. Two days after the training all the children were

interviewed about the lesson with the student teacher, first in a free recall paradigm to test the ability of the children to spontaneously use the technique and then those in the experimental condition were cued with the reminder cards present. The Narrative Elaboration Process had no effect on the free recall paradigm showing that the seven year old children had not internalised the strategies. However when the cue cards were presented children's recall improved 53% over controls.

A technique such as the Narrative Elaboration Process could be used in conjunction with the emotional re-enactment technique, but like the Cognitive Interview, might be most useful if it preceded the cue cards. The arousal from the emotional re-enactment in the memory network might be maintained during the visual cuing and further add to the retrieval process. Like the Cognitive Interview, this technique is new and has not yet been shown to be useful with younger children. Further research with this technique is warranted.

Limitations and Suggestions for Future Research

There were three features relating to the design of this study which limited the application of the results to the general task of interviewing young children. First, this study tested recall within a three day time frame. The results here pertained to children's memories of recent events and may not be generalised to more long term, established memories. Liwag and Stein (1995) showed that emotional re-enactment successfully enhanced children's recall of a real-life event for up to two weeks, however longer term investigations of children's recall are warranted to ascertain whether emotional re-enactment will be useful in enhancing children's distant memories. Studies using adults have found other methods of mood induction such as hypnosis, can enhance memories extending back years, even to childhood

(Bower, 1981) and future research should investigate whether children can use emotion to enhance memories over a longer time frame than two weeks.

Second, the current study investigated the effects of a happy mood on the recall of a happy event only. These results are therefore limited to events involving happy emotion and cannot be generalised to negative states of emotion. However other research has explored this and showed that positive mood creates a stronger effect on memory than negative mood (Bartlett et al, 1982; Bartlett & Santrock, 1979; Liwag & Stein, 1995; Nasby & Yando, 1982). Negative emotion may not enhance recall as well as positive emotion because people do not enjoy experiencing negative emotional states. Isen (1984) proposed that people actively defend themselves against negative emotional experiences by attempting to engage in positive experiences and repair their mood state. Liwag and Stein (1995) measured the effects of both positive and negative emotional re-enactment and reported that although happiness resulted in superior recall compared to other emotional states, emotional re-enactment of negative emotions (sadness, anger and fear) still improved recall compared to controls. Thus negative emotions may not effect memories to the same extent that positive emotions do, but negative emotions may still significantly improve retrieval. The relative value of inducing a negative mood would have to be weighed against the possible upset this might cause to the child. However the effects of negative and other moods (eg. Surprise) on memory should be further investigated since a variety of emotional issues besides happy ones are explored in clinical interviews with children.

A final limitation of the study was that because all children made very few errors, the experimental task may have been relatively easy for them. Remembering the story required the recall of items from a single stimulus, the book, which was read

by a single person. A more complex event, involving numerous stimuli and characters, might make more demands on children's attentional capacities and inflate the level of errors for all children. This could be investigated in future studies using a more sophisticated real-life events as the dependent variable.

Future research might also investigate the utility of real events to induce a mood state and achieve causal belongingness, given the positive findings regarding emotional re-enactment from this study. Bower (1987) maintained that the mood-state-dependent effect would only be obtained when subjects associated their emotional state to the to-be-remembered event (causal belongingness) but has not found support for this in laboratory studies. The current study achieved casual belongingness by engaging subjects in a real-life event to induce their mood state, and also achieved the mood-state-dependent effect. Future research using real events rather than the two-list laboratory design employed by Bower may add further understanding to Bower's hypothesis.

Future research should also investigate the relative merit of the memory enhancing strategies discussed here (emotional re-enactment, the Cognitive Interview, and the Narrative Elaboration Process) to explore which strategies are most helpful with young children who are most in need of retrieval strategies. The three techniques have all been shown to increase children's recall without inflating errors in various studies but have not been compared in a single study and have not been compared in a sample of same-aged children. Knowing the relative magnitude of improvement shown by each strategy will help interviewers to limit the number of strategies required for a single interview. Young children may become overwhelmed if presented with too many strategies, particularly if each strategy requires some training as the above techniques do. Also using the most efficient

retrieval strategies will help to limit the length of interviews and possibly avoid the need for repeated interviews.

The effect of emotional re-enactment on the recall of repeated versus uncommon events is another topic for future research. The current results showed that for a novel event emotional re-enactment improved children's recall of details about the event without increasing their recall of details about related events. However the study by Liwag and Stein (1995) which probably asked children to relate more common and thus repeated events, found children's recall of associated events also increased. The discrepancy in findings may be explained in the way children encode repeated events, so that common features of a repeated event are more easily activated than specific features (Bower, 1981; Powell and Thomson, 1996). However this was not directly tested by the current study and future research could clarify the relative effects of enhancing the recall of repeated versus novel events.

Finally future research should explore new strategies for enhancing young children's recall. It is well known that young children lack strategies to prompt their memories. However the majority of research to date has addressed the task of refining verbal interviews to reduce suggestibility and errors, rather than investigating new strategies which may directly enhance free recall. The concept of a semantic memory network provides many avenues for investigating such strategies, since it assumes that the full sensory experience of an event is recorded in inter-linked nodes. Re-enactment of any of the sensory experiences at recall should serve to enhance the memory of an event. For example re-enacting the physical actions of an event should enhance the memory for that event just as re-enacting the emotional state does. Further research could investigate the effects of

physical re-enactment on young children's memory as a starting point to investigate other sensory reactions as cues.

Conclusion

Overall the current study supported the use of emotion as a cue to enhance children's memories of happy events. The emotional re-enactment technique was shown to successfully induce an emotional state in 5 and 6 year old children and significantly improve their recall of a past event without any effect on errors in recall. This finding supports the use of emotional re-enactment for clinical and investigative interviews. This finding also supports Bower's (1981) hypothesis of mood-state-dependent memory.

The current study did not find any support for the use of the facial expression technique with young children, since recall was unaffected by forming a facial expression. Further research may be useful to determine whether this was due to individual or developmental differences in the ability to use facial expression to induce a mood state.

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Appendix A: Procedures Used to Train the Facial Expressions and Emotional Re-enactment in the Pre-test Interview

Face Labelling Task

The four face cards were presented together in random order.

Experimenter asks:

"Which one is a happy face?"

"Which one is a sad face?"

"Which one is an angry face?"

"Which one is a scared face?"

(The order in which these four questions were asked was counter-balanced for each subject.)

Training for Face Labelling:

If the child's response to any question was wrong then the child was engaged in up to two series of training. A training series consisted of the experimenter correcting the child's response and asking the child the four questions again.

Criteria for Inclusion:

Each child had to correctly label the four facial expressions within two training sessions for inclusion in the study. Any child requiring more than two training sessions was excluded from the experimental interview.

Facial Expression (FE) and Emotional Re-enactment (ER) Tasks:

The following emotions were randomly presented to the subject:

1. HAPPY

FE: Can you show me what your face looks like when you're happy?

ER: What do you look like when you're happy? (Show me something you do when you're happy?)

ER Prompt: What does your chest do when you're happy?

2. SAD

FE: Can you show me what your face looks like when you're sad?

ER: What do you look like when you're sad? (Show me something you do when you're sad?)

ER Prompt: What do your shoulders do when you're sad?

3. ANGRY

FE: Can you show me what your face looks like when you're angry?

ER: What do you look like when you're angry? (Show me something you do when you're angry?)

ER Prompt: What do your fists do when you're angry?

4. SCARED

FE: Can you show me what your face looks like when you're scared?

ER: What do you look like when you're scared? (Show me something you do when you're scared?)

ER Prompt: What do your shoulders do when you're sad?

Training for Facial Expression Task:

If a child's response to the facial expression question was inaccurate (eg. he/she smiled when asked to look angry) then the child was allowed to engage in up to two series of training for that facial expression. A series of training consisted of the experimenter saying, "Let me show you what my face looks like when I am (angry)" and modelling an appropriate facial expression. After each training the child was asked to make the facial expression again.

Inclusion Criteria for Facial Expression Task:

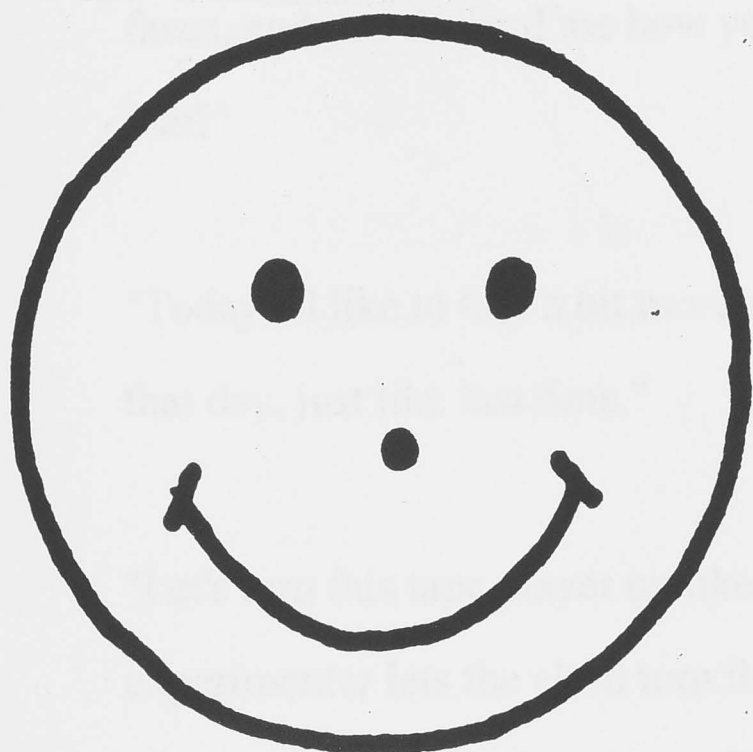
Each child had to produce a facial expression matching each of the four emotions within two training sessions for inclusion in the study. A facial expression was judged to be accurate if it included some common features for that expression as described by Ekman and Friesen (1975). For example, common features of a happy face included a smile, wide eyes, raised eyebrows; a lowered top lip, raised bottom lip and lowered eyes for a sad face; a terse mouth, slanted eyebrow and wrinkled brow for an angry face; and raised eyebrows, wide eyes and open mouth for a scared face.

Training for Emotional Re-enactment Task:

The emotional re-enactment task was not a test for inclusion in the study and there were no strict standards for emotional re-enactment. Children were encouraged to create their own state of emotional re-enactment through the two emotional re-enactment questions and the prompt. However any child who did not respond to the three requests to show what their body looked like, or any child whose body actions obviously contradicted the emotion in question (for example a child who mistook the card in question and pretended to cry when asked to show what they looked like when happy) was engaged in up to two series of training. A training

series consisted of the experimenter stating, "Let me show you what my body does when I am (happy)" and modelling a stereotyped response. For instance if the experimenter modelled a happy action she stood up tall with her chest out, head high, and a happy facial expression; for a sad action the experimenter dropped her head and shoulders, rubbed her eyes and adopted a sad expression; for an angry action she clenched her fists and adopted an angry expression; and for a surprised action she raised her arms and shoulders, sat up quickly and adopted a surprised expression. After each training the child was encouraged to mimic the experimenter and adopt their own pose.

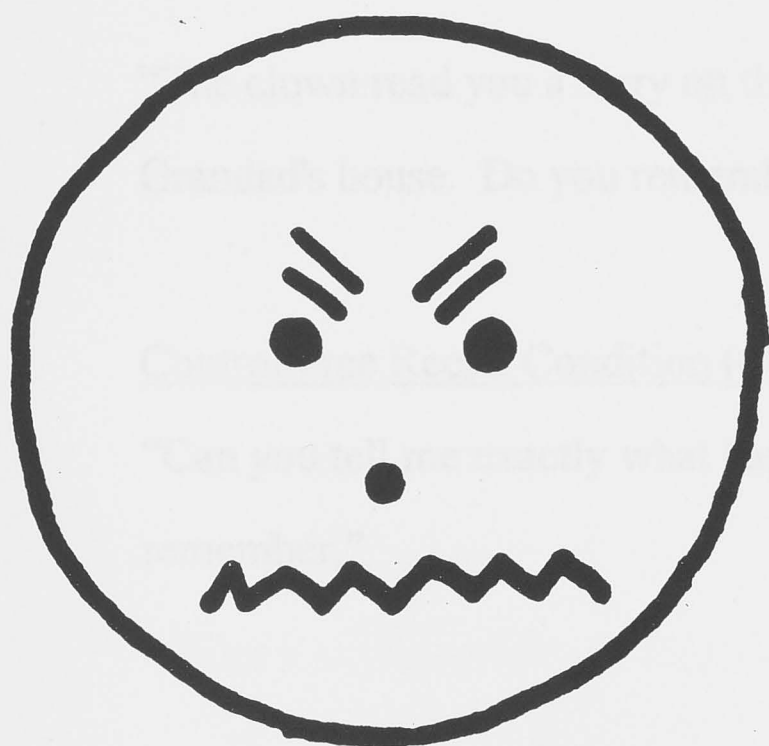
Appendix B: Face Stimuli for the Face Labelling Task presented in the Pre-Test
Interview



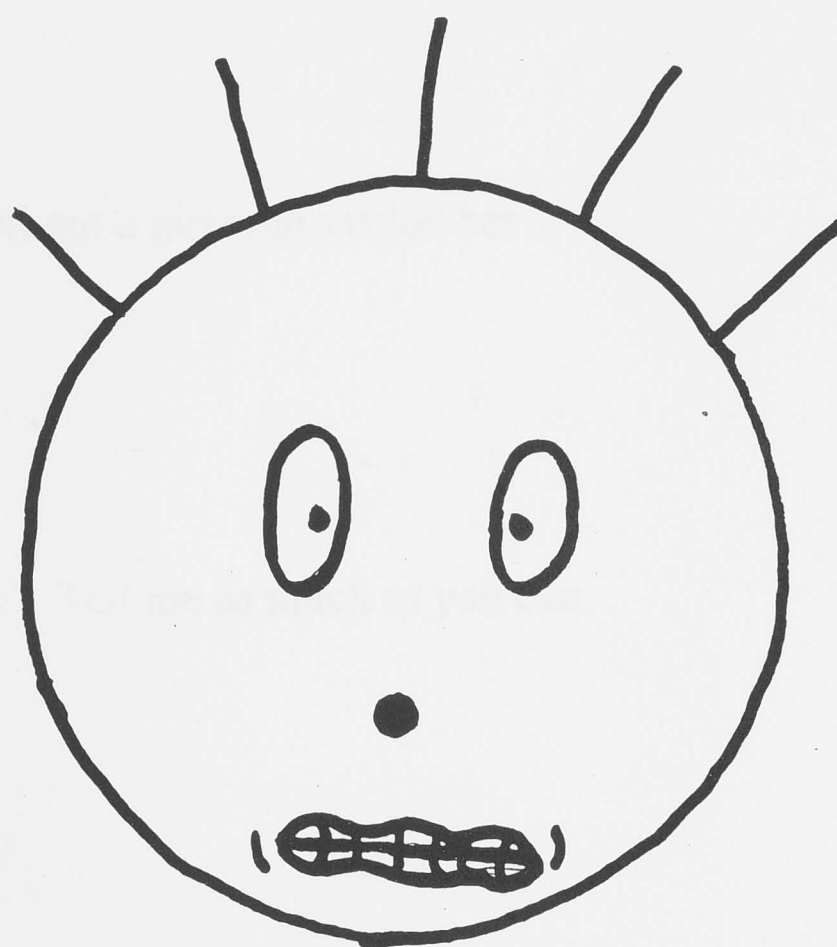
HAPPY



SAD



ANGRY



SCARED

Appendix C: Procedures for Conducting the Experimental Interview

Introduction to Session (all conditions) "Last time I was here we talked about feelings and looked at some cards with faces, and you made some lovely pretend faces, and you showed me how your body looks sometimes. Do you remember that?"

"Today I'd like to talk a bit more about some of the other things that happened on that day, just like last time."

"Let's turn this tape player on like before. Can you remember how?" (The experimenter lets the child turn the tape player on.) "Can you say your name?"

"Ok we'd better check and see if it worked"

"Do you remember the other day at school when the clown came to visit?" "Do you remember when you got the balloon?"

"The clown read you a story on that day which was about a girl who visited her Grandad's house. Do you remember that story?"

Control/Free Recall Condition (Condition 1)

"Can you tell me exactly what happened in the story? Tell me as much as you can remember."

Facial Expression Condition (Condition 2)

"Tell me how you felt when you heard that story."

"Can you make a face to show me how you felt when you heard the story?"

"Can you tell me exactly what happened in the story? Tell me as much as you can remember."

Emotion Re-enactment Condition (Condition 3)

"Tell me how you felt when you heard that story."

"Can you make a face to show me how you felt when this happened?"

"Now, can you tell me exactly what happened in the story? Try to remember what it feels like to be (happy) just like when you heard the story. (Can you show me what you look like when you're happy? Do you feel happy?) Now try to remember what happened in the story. Pretend to be happy and at the same time tell me the story. Tell me as much as you can remember."

Probes

Probe questions were presented after the initial questions in each of the three conditions. The probe questions follow:

"What did you think about when you heard the story?"

"What did you do?"

"How did the story end?"

"Can you remember anything else about the story or about the day the clown visited?"

Appendix D: Rules for Coding Children's Responses

Step 1: Code Clausal Units**Clausal Unit (Code = "C")**

- **Roughly a simple sentence (a noun and verb)**
- Included **statements** "a penguin" or "camel" (because "I saw" is implied)
- **Two clauses** in a sentence which were connected by "and", "when", etc were counted as two separate clauses.
eg. " They were in the garden and Grandpa was in the wheelbarrow."
should have been scored as two clauses. "There was sand in the floor when the TV was in the fishbowl" was scored as two clauses.
- "No", "I don't remember any more," "That's all", "That's the end of the story" etc. were not counted as clausal units. Even if it was the only response they give.
- Information gathered **before the interview** questions or after the final question has been responded to as "no" or some equivalent was not counted as a clausal unit.

STEP 2: Score each Clausal Unit as either an Informative clause or a Non-Informative Clause**Informative Clause (Code = "I")**

- **Sensible clauses**
- Information **related to the story** (right or wrong)
- Information **related to the clown visit**

- What they or **friends** did or descriptions of this, "My friend has brown hair." "I laughed at Robert."
- Comments about the **balloons** "We got balloons"
- **Impressions** of the story, "I liked it", "It was funny."

Non-Informative Clauses (Code = "NI")

- **No direct relationship to the story**
- **Spontaneous repetitions**, unless by repeating they also added extra information

eg. If a child said, "They all laughed" and later said, "They all laughed" again to one of the prompts, then the second clause was counted as a *non-informative clause*. However if a child later said, "They all laughed because Grandpa had different socks," then the second clause was scored as *informative* and *direct*.

- **Non-spontaneous repetitions** requested by the interviewer. The spontaneous repetitions were used to decide if the first clause was something related to the story or to the day the clown visited in which case it was scored as *direct*. If it was related to something else it was scored as *associative*.

eg. If a child said, "A bird." and on clarification then said, "The girl went over the water and was riding on the swan." then code the first clause as *informative* and *direct*. Code the second clause as a *non-informative* clause. If after the clarification the child said, "The bird at my house." then the first clause was scored as *informative* and *associative*. The second clause would have been coded as *non-informative*

- **Off-task verbalisation's** ("Let me play with the tape player", "Can we listen to it (the tape recording) again?")
- **Unintelligible speech**

STEP 3: Code every Informative Clause as either a Direct or an Associative Clause

Direct Clause (Code = "D")

- **Information directly linked to the STORY only**
- **Correct information only**

Associative Clause (Code = "A")

- Events which **preceded or followed** the STORY or were somehow **associated** in the child's mind with the event, but not directly related to the story. Basically whatever the child seemed to equate with their memory of the day they heard the story.
- Information related to the **clown's visit**, "She gave us balloons," "I went to a clown party."
- Things about **friends** during the story "I was pulling my friends hair." things about **balloons and home**. "I gave my brother my balloon."
- Impressions of the story, "Grandad was funny." "I liked the clown."
- **Errors**: any **incorrect** recollections of the story. eg. "There was a dinosaur."